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Two new species of Leiodinae from India and Vietnam with taxonomic and distributional notes (Coleoptera: Leiodidae)

Fernando ANGELINI[1] & Zdeněk ŠVEC[2]

[1] S. S.7 per Latiano, Km. 0,500, I-72021 Francavilla Fontana (Brindisi), Italy
[2] Žerotínova 47, CZ-130 00 Praha 3, Czech Republic

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Abstract. *Agathidium (Microceble) pseudopalnicum* sp. n. from India and *Colenisia compacta* sp. n. from Vietnam are described. *Colenis terrena* Hisamatsu, 1985 is transferred to the genus *Dermatohomoeus* Hlisnikovský, 1963. Some distributional data of Leiodinae from India (Tamil Nadu and Kerala) are added.

Taxonomy, new species, distribution, Coleoptera, Leiodidae, Leiodinae, Oriental region

INTRODUCTION

Leiodinae from India and Vietnam were recently studied by Angelini (1995), Angelini & De Marzo (1981, 1983, 1984a, b, c, 1985, 1986, 1987), Angelini & Cooter (1986), Angelini & Stephenson (1990), Daffner (1988a, b, 1991) and Švec (1996).

Present work is based on 3 species in 25 specimens collected by David Boukal and Zbyněk Kejval in India and on 2 species in 3 specimens collected by Sándor Mahunka in Vietnam.

The material examined includes two species new to science – *Agathidium (Microceble) pseudopalnicum* sp. n. from Kerala (India) and *Colenisia compacta* sp. n. from Vinh Phu (Vietnam). Faunistic data about two Indian *Agathidium* Panzer, 1797 are also included. During the studies in *Dermatohomoeus* was done a conclusion, that the species *Colenis terrena* belongs to the genus *Dermatohomoeus*.

The specimens examined are deposited in Švec's collection (SC), in Angelini's collection (AC) and in the collection of the Hungarian Natural History Museum Budapest (HNHM).

RESULTS

Agathidiini Westwood, 1838

Agathidium (Microceble) pseudopalnicum sp. n.

TYPE MATERIAL. Holotype, male: India, Kerala, Cardamon Hills, 15 Km SW Munnar, Kallar Valley, 1000 m [above sea level], 10° 02' N 76° 58' E, 6.–18.xii.1993, Boukal & Kejval leg., deposited in SC. Paratypes: the same data, 5 males and 3 females (SC), 1 male and 1 female (AC).

DESCRIPTION. Length 3.2–3.5 mm. Length of body in holotype 3.4 mm, head 0.7 mm, pronotum 1.2 mm, elytra 1.5 mm, antenna 0.7 mm, width of head 0.8 mm, pronotum 1.6 mm, elytra 1.6 mm, height of pronotum 1.2 mm, elytra 0.9 mm.

Head red-brown, pronotum and elytra black, lighter at sides, mesosternum paler, metasternum reddish-brown; antennae uniformly testaceous; legs reddish-brown. Microreticulation absent on the whole dorsum; puncturation fine and sparse on the whole dorsum. Sutural striae absent.

Head. *Punctures small, superficial, spaced by 3–5 times their diameter.* Head widest at eyes; antero-lateral margins distinctly raised up. Clypeus weakly excavate, with a short groove and a small pit at each side. Eyes hemisphaerical (Fig. 1). 3rd antennal segment 1.3 times longer than 2nd and as long as combined length of 4th+5th ones.

Pronotum. Punctures a little larger and more impressed than those on head, spaced by 2–6 times their diameter. Anterior margin deeply emarginated, lateral outline broadly rounded.

Elytra. *Puncturation the same as on head, punctures spaced by 4–10 times their diameter.* Lateral outline with very weak humeral angle.

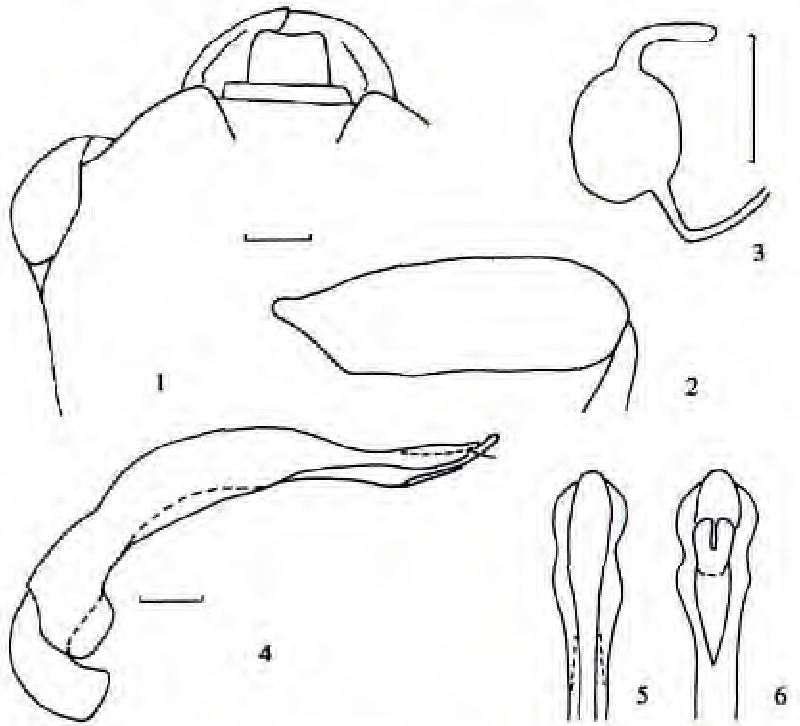
Meso- and metasternum. Lateral lines absent, femoral lines incomplete, as long as the half of width of metasternum, a pronounced tubercle between the metacoxae present. Membranous wings absent.

Legs. Male hind femora simple at posterior margin (Fig. 2). Tarsal formula: male 5–5–4, female 5–4-4.

Genitalia. Aedeagus as in Figs 4, 5, 6, spermatheca as in Fig. 3.

Bionomy. Not known.

Etymology. The name is derivated from the similarity of the new species to *Agathidium palnicum*.



Figs 1–6. *Agathidium pseudopalnicum* sp. n.: 1 – head, 2 – male hind femora, 3 – spermatheca, 4 – aedeagus laterally, 5 – the same dorsally, 6 – the same ventrally. Scale 0.1 mm.

DIFFERENTIAL DIAGNOSIS. *A. pseudopalnicum* sp. n. belonging to *A. andrewesi* species-group is closely related to *A. palnicum* before all by similar shape of aedeagus, by lacking of microreticulation and by fine and sparse puncturation of dorsum, by absence of sutural striae and by uniformly testaceous antennae. Both species differ by ratio of 3rd/2nd antennal segments, which is 1.0 in *A. palnicum* and 1.3 in *A. pseudopalnicum* and mainly by the shape of the parameres, which are simply bent at its lateral margin in the first named species while they are sinuously curved at lateral margin in *A. pseudopalnicum*.

Agathidium (Microceble) palnicum **Angelini & De Marzo, 1986**

Agathidium (Microceble) palnicum Angelini & De Marzo, 1986: 446.

MATERIAL EXAMINED. S India, Kerala, Palmi Hills, 30 km E Munar, Top Station, 1900 m above sea level, 10° 08'N 77° 15'E, 2.–3. xii.1993, Boukal & Kejval leg., 1 male (SC).

Species distributed in India (Kerala and Tamil Nadu).

Agathidium (Microceble) mussardi **Angelini & De Marzo, 1986**

Agathidium (Microceble) mussardi Angelini & De Marzo, 1986: 449.

MATERIAL EXAMINED. S India: Tamil Nadu, Nilgiri Hills, 15 km SE Kotagiri, 900 m, Kunchappanai, 11° 22' N 76° 56' E, 17.–28.xi.1993, 3 female (SC), 1 male and 1 female (AC); 30 km W Kumily, Peermade, 900 m, 09° 34' N 76° 59' E, 25.xii.1993, 2 male (SC); Kerala, Cardamon Hills, 15 km SW Munnar, Kallar Valley, 1000 m, 10° 02' N 76° 58' E, 6.–18.xii.1993, 1 male and 4 female deposited in SC; Kerala, Cardamon Hills, 10 km SW Kumily, Vallakadavu, 1000 m 09° 31' N 77° 07' E, 24.xii.1993, 1 male (SC). All material leg. Boukal & Kejval.

Species distributed in India (Kerala and Tamil Nadu).

Pseudoliodini Portevin, 1926

Colenisia compacta **sp. n.**

TYPE MATERIAL. Holotype, male: Vietnam, Vinh Phu prov., Tam Dao, 21.i.1986, Mahunka leg., (HNHM).

DESCRIPTION. Length 0.9 mm, head 0.05 mm, pronotum 0.30 mm, elytra 0.55 mm, antenna 0.30 mm, maximum width of head 0.25 mm, pronotum 0.50 mm, elytra 0.55 mm (in anterior third). Height of pronotum 0.30 mm, elytra 0.55 mm.

Oval, chestnut brown, legs, mouth yellow-red, 1st to 6th antennal segments yellow, 7th to 11th antennal segments light red-brown, last segment of maxillary palpus yellow-brown. Underside of body red-yellow, metasternal process red-brown, margins of metasternal and mesosternal processes darker.

Head. Puncturation sparse, superficial, punctures separated by 5–8 times their diameter. Punctures with very fine and short hairs. Interstices without microsculpture except of some traces of strigosities on clypeus. Eyes large, ratio of width head/eye = 1.00/0.17. Clypeal line lacking. Ratio of length of 2nd and all following antennal segments (2nd segment equal to 1.0): 1.0–1.0–0.5–0.3–0.5–1.0–0.3–1.0–0.8–1.8. The same ratio of maximum width of antennal segments: 1.0–0.8–0.5–0.5–0.5–1.0–0.8–1.3–1.5–1.5.

Pronotum. Puncturation much more finer and sparser than those on head. Punctures very small, superficial and rare, some of them bearing very short and fine hairs. Interstices smooth. Basis of pronotum unbordered, straight. Hind angles slightly sharp, its tip angular in dorsal view and slightly obtuse with tip very shortly rounded laterally seen.

Elytra. Very sparsely, irregularly and finely punctate, punctures separated by 8–10 times their diameter in average. Smooth in basal part while posterior two thirds of the length of elytra with transversal strigosites, the distance between strigosities 0.02 mm. Strigosities become more distinct toward apex of elytra. Sutural striae missing. Some erected setae scattered throughout elytral sides.

Meso- and metasternum. Mesosternal carina as in Fig. 8. Metasternum microsculptured by oblique elongate cells, central part of metasternum raised, covered by traces of microsculpture, with sparse recumbent hair. Membranous wings developed.

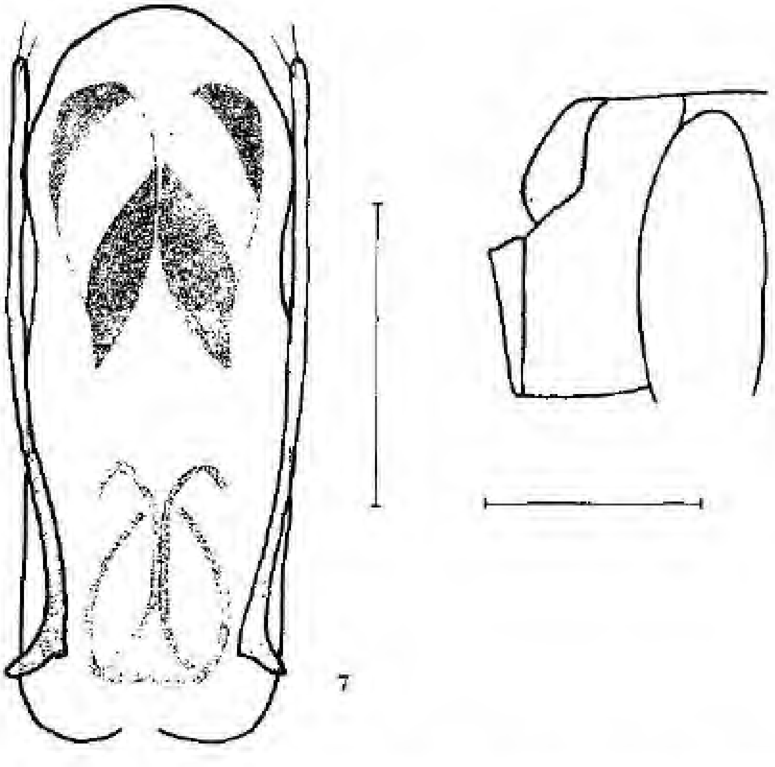
Legs. Without striking characters, 1st to 3rd anterior tarsal segments slightly dilated in male.

Genitalia. Aedeagus as in Fig. 7, female unknown.

Bionomy. Not known.

Etymology. The name is derivated from the compact body of the species.

Differential diagnosis. *Colenisia compacta* sp. n. is similar to *C. punctatula* Daffner, 1991 in absence of strigosities on head and pronotum and by partly strigose elytra. New species differs by much broader tip of aedeagus, by the shape of endophallus (see Fig. 6 and Daffner 1991: figs 25, 26). It differs also by the elytra covered by strigosities in the terminal two thirds, while strigosities are present only on sides and on apex of elytra in *C. punctatula*.



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Figs 7–8. *Colenisia compacta* sp. n.: 7 – aedeagus dorsally, 8 – mesosternal carina laterally. Scale 0.1 mm.

Dermatohomoeus terrenus (Hisamatsu, 1985) comb. n.

Colenis terrena Hisamatsu, 1985 7

According to characters of mesosternal carina and antennae which are figured in original description (Hisamatsu 1985 fig 7) *Colenis terrena* undoubtedly belongs to the genus *Dermatohomoeus* Hlisnikovský, 1963 Presence of a groove laterally visible between mesosternal carina and anterior raised part of mesosternum is typical in the genus *Dermatohomoeus* The groove is lacking in the genus *Colenis* Erichson, 1841 Also slender antennal club is equal to those in *Dermatohomoeus*.

That is why there is proposed new generic combination for the species mentioned

Acknowledgement

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BOOK REVIEW

FERRARIS J. D. & PALUMBI S. R. (eds): **Molecular Zoology. Advances, Strategies, and Protocols.** New York, Chichester, Brisbane, Toronto, Singapore: Wiley-Liss. A John Wiley & Sons, Inc., 1996. 580 pp. Format 155×233 mm. Softcover, price Lstg 37.50. ISBN 0-471-14461-4.

The first editor is specialist affiliated with National Institutes of Health (NIH) in Bethesda, Md., the second author is at the University of Hawaii in Honolulu. The list of contributors contains 52 other experts, mostly from USA, only two of them are from Europe – Great Britain and Germany. As stated in the foreword by M. G. Hadfield, the president, this volume reflects the society-wide symposium on molecular zoology and evolution, organized by The Society of Integrative and Comparative Biology (formerly the American Society of Zologists). This symposium took place January 5–8, 1995 in St. Louis, Mo. In the preface, the editors emphasize that molecular tools are the domain not only of cell biologists and biochemists, but now are appropriate for answering important questions in many other fields such as ecology, evolution, physiology and development. The selection of contributors – from destdoctoral fellows to established researchers – was intended to take advantage of a wide range of molecular tools in a wide range of systems. The format of this book is designed to bring together researchers currently using molecular techniques in a great variety of ways, and to make this expertise accessible to researchers of all profiles who would like to incorporate molecular tools in their own work. The contributors were asked to describe a particular molecular approach in detail, showing not only the conceptual goals, but also, the methods by which these goals are achieved. Principally in this volume genetic themes are discussed. At the very beginning, a list of 64 protocols listed alphabetically by author is given. The volume consists of two thematic sections. The first section **Molecular Zoology** is devoted to research strategies. It is organized into four parts incorporating 22 chapters in all. Particular chapters are supplied by summary type tables and illustrated by figures, line drawings and photographs featuring miscellaneous graphs and schemes, blot analyses, gene trees, PCR products, DNA fingerprints, flowcharts, geographic charts, life cycles, biological and computer simulated structures, and the like. Each chapter is concluded with an extensive list of original scientific reports. **Part 1 Systematics, Phylogeny, and Databases** embraces chapters 1 through 3. The authors will review the use of the Internet for retrieval of biological information, examine the range of biological databases currently available via the Internet, and highlight the development of new database design and implementation strategies. Computerized databases now represent everything from laboratory and field data to details of protein structure and function. The computers enable to use the databases as archives and research tools. Following chapters cover applications and performance of parametric bootstrapping in molecular phylogenetics and offer a definition of phylogenetic biology as the study of phylogenetic history of organisms, and of its relationships to the process of evolution. **Part 2 Population structure and Molecular Markers** is composed of chapters 4 through 9. In chapter 4 RAPD (randomly amplified polymorphic DNA) markers are used to characterize genetic relationships and population structures. Following chapters focus on microspatial genetic structure and speciation, application of molecular methods to the study of biological invasions, genetic mating systems, and genetic relatedness and pedigrees. Chapter 9 is devoted to PCR based cloning across large taxonomic distances and polymorphism detection. Notably two general molecular problems are discussed here – first, how genes characterized in one or more species acquire species-specific genetic information in other species, second, how does one efficiently detect genetic variation so that populations can be screened effectively for either known or unknown variants. As an example studies on the major histocompatibility complex (MHC) in man and mouse are looked at. **Part 3 Classic Problems in the Evolution of Growth and Development** contains chapters 10 through 16. These chapters deal with strategies for cloning developmental genes using closely related species, evolution of developmental systems in the nematode model organism, and mechanisms by which differential genomic expression is first established in the various spatial domains of the sea urchin embryo. Furthermore, looked at are evolutionary approaches to analyzing development, in situ hybridization studies of developmental genes and gene expression during ontogeny, and lineage analysis using retroviral vectors. **Part 4 Evolution in Variable Environments and Physiological Adaptation** includes chapters 17 through 22. In this part examined are gene regulation of response to variable osmotic environments, a multidisciplinary approach for a better understanding of the evolutionary mechanisms that affect genetic variation of enzyme-encoding loci in natural populations, and molecular studies leading to better understanding of how animals cope with the challenge of oxygen transport during development. In concluding chapters sex determination of nonmammalian vertebrates, control of reproductive behaviour and sexual differentiation of brain in rodents, and models for basic reseach and biotechnological applications are outlined. The second section **Protocols** focuses on descriptions of laboratory techniques and procedures. It presents a detailed compilation of over 60 protocols which have been developed, tested, and perfected by leading researchers. It provides step-by-step coverage of each protocol, featuring for each a summary of its underlying rationale, a list of necessary reagents and solutions, and a discussion of potential obstacles to a particular technique. Specific techniques covered include: cloning and cell preparation, DNA preparation and manipulation, gel electrophoresis, hybridization, molecular characterization of macromolecules, polymerase chain reaction, RNA expression and transfection, and sequencing. In conclusion protocols by author and application codes are indexed. Contemporaly tools of molecular biology continue to open new areas of biological research and provide important answers to classic problems. Mating strategies, physiological adaptation, genetic exchange between populations, cell lineages during development, and many others are now being powerfully adressed using tools from the molecular arsenal. This volume presents an authoritative resource designed to provide both basic and in depth explanations of molecular investigation procedures for research scientists in all areas of organismal and integrative biology. Graduate students in diverse fields of biology will find this book to be an indispensable manual for laboratory work.

Jindřich Jíra

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Aquatic molluscs (Gastropoda, Bivalvia) of the Dolnomoravský úval lowland, Czech Republic

Luboš BERAN[1] & Michal HORSÁK[2]

[1] Kokořínsko Protected Landscape Area Administration, Česká 149, CZ–276 01 Mělník, Czech Republic
[2] Department of Zoology and Ecology, Faculty of Science, Masaryk University, Kotlářská 2, CZ–611 37 Brno, Czech Republic

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Abstract. Aquatic molluscs of the Dolnomoravský úval lowland (Southern Moravia, Czech Republic) were investigated in 1996 and 1997. Altogether 53 aquatic species were found at 165 localities under study. Populations of very rare and endangered molluscs – *Theodoxus danubialis* (C. Pfeiffer, 1828), *Viviparus acerosus* (Bourguignat, 1862), *Lithoglyphus naticoides* (C. Pfeiffer, 1828), *Bithynia leachi* (Sheppard, 1823), *Anisus vorticulus* (Troschel, 1834), *Unio crassus* Philipsson, 1788, *Pseudanodonta complanata* Rossmässler, 1835, *Sphaerium rivicola* (Lamarck, 1818), *Pisidium moitessierianum* (Paladilhe, 1866) were found. Findings of *P. moitessierianum* are first for Moravia.

Distribution, aquatic molluscs, Czech Republic

INTRODUCTION

Area near the confluence of the Morava and the Dyje rivers belongs to most valuable floodplain areas in the Czech republic. Wetlands in this region are listed in the Ramsar List of Wetlands of International Importance. Only to this area involves occurrence of pontic molluscs from the Danube river basin and also aquatic malacofauna of this area was not particularly studied recently. All these facts were reasons for the following detailed research results of that are presented below.

MATERIAL AND METHODS

Aquatic molluscs were mostly collected from vegetation or from sediment by means of a sifter.

The system and nomenclature are adopted from Glöer & Meier-Brook (1994), only the system and nomenclature of the family Lymnaeidae follow Jackiewicz (1993). Molluscs were determined according to conchs, in case when determination according to conchs is not possible, specimen were dissected by the senior author. Material from localities visited by M. Horsák or by both the authors is deposited in the collection Horsák.

TERRITORY OF INVESTIGATION

The area studied is situated in the Southern Moravia (the Morava river basin and the Dyje river basin) between Napajedla on the Morava river, Nové Mlýny reservoir on the Dyje river and confluence of these two rivers on the Czech-Austrian-Slovak border. The area is covered by agricultural lands, floodplain forests, wetlands, pools, ponds, canals and rivers. The both big rivers (Dyje, Morava) are canalized on most of their watercourse. A series of three reservoirs was constructed at Nové Mlýny (on the Dyje River), over 3 000 ha in continuous water surface.

A survey of investigated localities

Data in the survey are as follows – number of the locality, geographical coordinates (N, E), code of the mapping square for faunistic mapping according to Buchar (1982), type (sometimes also name) of biotop (r – river, c – canal, p – pond, ps – ponds, po – pool, b – brook), date of investigation, name of investigator (LB – Luboš Beran, MH – Michal Horsák, LB+MH – both authors).

1 – 48° 54' 45", 16° 36' 25"; 7065, Nove Mlýny reservoir and confluence of Jihlava r and Svratka r. (18 IX 1996, LB); **2** – 48° 51' 20", 16° 44' 10", 7166, Dyje r (19. IX 1996, LB), **3** – 48° 50' 45", 16° 43' 50"; 7166, canal (3 X 1997, LB); **4** – 48° 50' 55", 16° 43' 40", 7166, Mlynský náhon c (4 IX., 8 IX., 3 X 1997, LB), **5** – 48° 47' 30", 16° 37' 20", 7265, canal (29 IX 1997, LB), **6** – 48° 47' 50", 16° 41' 15", 7266, Mušlovské rybníky ps. (18 VII 1997, MH), *7 – 48° 47' 00", 16° 40' 40"; 7266, Novy rybník p. (10 IX 1997, MH), 8 – 48° 46' 30"*, 16° 42' 40", 7266, Nesyt p (10 IX 1997, MH); **9** – 48° 46' 45", 16° 45' 30", 7266, small p. (10. IX 1997, MH); **10** – 48° 46' 45", 16° 46' 35", 7266, Hlohovecký rybník p (11 IX. 1997, MH); **11** – 48° 45' 50", 16° 47' 20", 7266, Alab p (11. IX. 1997, MH), **12** – 48° 46' 35", 16° 47' 50"; 7266, small p. (11. IX 1997, MH); **13** – 48° 46' 50", 16° 48' 00", 7266, Prostřední rybník p. (11. IX 1997, MH), **14** – 48° 47' 15", 16° 49' 10"; 7266, Mlýnský rybník p (11 IX 1997, MH); **15** – 48° 49' 35", 16° 45' 40", 7166, pool (4 IV 1997, MH); **16** – 48° 49' 20", 16° 45' 50", 7166, Lednický náhon c (20 IX 1996, LB); **17** – 48° 49' 30", 16° 46' 05", 7165, shallow po (4 IV 1997, MH); **18** – 48° 49' 20", 16° 46' 10", 7166, arm of Dyje r (4. IV. 1997, MH); **19** – 48° 49' 40", 16° 46' 20", 7166, Dyje r (19 IX 1996, LB); **20** – 48° 48' 50", 16° 46' 50", 7166, Lednický náhon c (20 IX 1996, LB), **21** – 48° 49' 35", 16° 46' 50"; 7166, pool (4 IV 1997, MH), **22** – 48° 49' 35", 16° 47' 00", 7166, shallow po (4 IV 1997, MH); **23** – 48° 49' 25", 16° 47' 05", 7166, shallow po (4 IV 1997, MH), **24** – 48° 49' 20", 16° 47' 25", 7166, shallow po. (marsh) (4 IV 1997, MH), **25** – 48° 48' 50", 16° 48' 05"; 7166, large shallow po (Pastvisko) (10. IV. 1997, MH); **26** – 48° 48' 55", 16° 48' 15", 7166, canal (10 IV. 1997, MH); **27** – 48° 48' 10", 16° 48' 20", 7166, Lednický náhon c. (20 IX. 1996, LB), **28** – 48° 48' 15", 16° 48' 40", 7166, Lednický náhon c (20. IX 1996, LB), **29** – 48° 48' 05", 16° 48' 45", 7166, pond (10 IV 1997, LB); **30** – 48° 48' 40", 16° 49' 10"; 7166, Lednický náhon c (20 IX 1996, LB); **31** – 48° 49' 30", 16° 49' 40", 7166, small b (6 IX 1997, LB+MH); **32** – 48° 48' 00", 16° 49' 35", 7266, small c. (10 IX. 1997, LB+MH), **33** – 48° 48' 25", 16° 50' 15", 7166, small c. (10 IV 1997, MH), **34** – 48° 48' 20", 16° 50' 00"; 7166, Lednický náhon c (20 IX 1996, LB); **35** – 48° 48' 00", 16° 50' 40", 7267, canal (10 IX. 1997, LB+MH); **36** – 48° 48' 25", 16° 51' 05"; 7167, pool *(10 IV. 1997, MH); 37 – 48° 47' 35", 16° 51' 00"*; 7267, *canal (10. IX. 1997, LB+MH)*; **38** – 48° 47' 40", 16° 52' 20", 7267, sandpit (10 IX 1997, LB+MH); **39** – 48° 47' 00", 16° 52' 15", 7267, canal (10 IV. 1997, LB+MH); **40** – 48° 46' 10", 16° 52' 10"; 7267, sandpit (10 IX 1997, LB+MH), **41** – 48° 45' 25", 16° 52' 20", 7267, canal (Nová Dyje) (20 X 1996, LB), **42** – 48° 45' 25", 16° 52' 25"; 7267, sandpit (20 X 1996, LB), **43** – 48° 46' 00", 16° 53' 20"; 7267, Dyje r. (9 IX. 1997, LB+MH); **44** – 48° 47' 35", 16° 54' 00", 7267, Žižkovský potok b (10 IX 1997, LB+MH); **45** – 48° 47' 00", 16° 54' 10", 7267, sandpit (10 IX. 1997, LB+MH), **46** – 48° 46' 25", 16° 54' 45"; 7267, Svodnice c (3. X 1997, LB), **47** – 48° 44' 40", 16° 53' 30", 7267, pool (25. IV 1997, MH), **48** – 48° 44' 45", 16° 55' 30", 7267, Svodnice c. (6. IX. 1997, LB+MH); **49** – 48° 44' 40", 16° 53' 15", 7267, canal (21 IX 1996, LB), **50** – 48° 44' 15", 16° 53' 15", 7267, canal (25 IV. 1997, MH), **51** – 48° 44' 00", 16° 52' 35", 7267, canal (Nová Dyje) (21 IX 1996, LB), **52** – 48° 44' 00", 16° 54' 10"; 7267, pool (25 IV 1997, MH); **53** – 48° 43' 45", 16° 52' 50"; 7267, Dyje r (21. IX 1996, LB); **54** – 48° 43' 50", 16° 53' 45"; 7267, shallow po (25 IV. 1997, MH); **55** – 48° 43' 45", 16° 53' 35"; 7267, shallow po (21 IX 1996, LB), **56** – 48° 43' 35", 16° 53' 50", 7267, sandpit (25 IV 1997, MH), **57** – 48° 43' 40", 16° 54' 50", 7267, pool *(25 IV 1997, MH)*; **58** – *48° 43' 30", 16° 53' 25"; 7267, arm of Dyje r. (21 IX 1996, LB)*; **59** – 48° 43' 25", 16° 54' 10"; 7267, shallow po (19 X 1996, LB), **60** – 48° 43' 40", 16° 55' 45"; 7267, Svodnice c (9 IX 1997, LB+MH), **61** – 48° 42' 55", 16° 55' 10"; 7267, pool (4 X. 1997, LB+MH); **62** – 48° 42' 10", 16° 55' 50", 7267, *shallow po (4 X 1997, LB+MH)*; **63** – *48° 42' 15", 16° 57' 10"*; 7267, Svodnice c (9. IX. 1997, LB+MH), **64** – 48° 41' 55", 16° 57' 00", 7267, canal (9 IX. 1997, LB+MH); **65** – 48° 41' 30", 16° 55' 10"; 7267, Dyje r. (19 X. 1996, LB), **66** – 48° 41' 15", 16° 57' 40", 7367, Jizda c. (9. IX 1997, LB+MH), **67** – 48° 41' 10", 16° 57' 15"; 7367, Kyjovka r (9. IX. 1997, LB+MH), **68** – 48° 40' 55", 16° 56' 25", 7367, Kyjovka r (6 IX 1997, LB+MH), **69** – 48° 40' 50", 16° 56' 45"; 7367, shallow po (13. V 1997, MH); **70** – 48° 40' 45", 16° 56' 55"; 7367, shallow po (13 V 1997, MH); **71** – 48° 40' 45", 16° 57' 15", 7367, canal (9. IX 1997, LB+MH); **72** – 48° 35' 50", 16° 56' 25", 7367, pool (13 V 1997, MH); **73** – 48° 39' 45", 16° 56' 50", 7367, canal (6 IX 1997, LB+MH); **74** – 48° 39' 45", 16° 56' 00"; 7367, Kyjovka r. (6 IX. 1997, LB+MH), **75** – 48° 39' 35", 16° 56' 35", 7367, sandpit (4 X. 1997, LB+MH), **76** – 48° 39' 25", 16° 55' 40"; 7367, Kyjovka r. (6 IX 1997, LB+MH), **77** – 48° 39' 15", 16° 56' 40", 7367, canal (4 X 1997, LB+MH); **78** – 48° 39' 05", 16° 55' 15"; 7367, Dyje r (9 IX 1997, LB+MH), **79** – 48° 38' 50", 16° 52' 30", 7367, canal (4 X 1997, LB+MH), **80** – 48° 38' 50", 16° 56' 05"; 7367, shallow po (4 X 1997, LB+MH); **81** – 48° 38' 40", 16° 56' 00", 7367, pool (13. V. 1997, MH), **82** – 48° 37' 30", 16° 57' 20", 7367, large po (Sekulská Morava) (4 X 1997, LB+MH); **83** – 48° 37' 55", 16° 57' 20"; 7367, pool *(13 V 1997, MH), 84 – 48° 38' 00", 16° 57' 40", 7367, sandpit (13 V. 1997, MH)*, **85** – 48° 38' 10", 16° 57' 40", 7367, large po (4 X 1997, LB+MH), **86** – 48° 38' 20", 16° 57' 25", 7367, canal (6 IX 1997, LB+MH); **87** – 48° 38' 40", 16° 58' 00"; 7367, large po. (4 X 1997, LB+MH); **88** – 48° 38' 45", 16° 57' 50", 7367, canal (4 X 1997, LB+MH); **89** – 48° 40' 05", 16° 57' 55", 7367, canal (4. X. 1997, LB+MH), **90** – 48° 44' 05", 17° 01' 20", 7268, Morava r. (20 X 1996, LB); **91** – 48° 41' 30", 16° 58' 40", 7367, Jizda c (6 IX 1997, LB+MH), **92** – 48° 41' 40", 16° 59' 00", 7267, Jizda c. (21. X. 1996, LB), **93** – 48° 42' 40", 16° 58'

30"; 7267, Jizda c. (21. X. 1996, LB); **94** – 48° 43' 40", 16° 58' 40", 7267, Kyjovka r. (21. X. 1996, LB), **95** – 48° 43' 30", 16° 59' 55"; 7267, Jizda c. (20. X. 1996, LB); **96** – 48° 43' 40", 16° 59' 45", 7267, small c. (8. IX. 1997, LB), **97** – 48° 43' 40", 16° 58' 40"; 7267, Kyjovka r. (20. X. 1996, LB), **98** – 48° 43' 55", 17° 00' 10"; 7268, Jízda c. (8. IX. 1997, LB); **99** – 48° 43' 55", 16° 59' 25", 7268, canal (10. IX. 1997, LB+MH); **100** – 48° 44' 00", 16° 59' 50"; 7268, pool (30. IX. 1997, LB), **101** – 48° 44' 05", 17° 00' 00"; 7268, canal (30. IX. 1997, LB), **102** – 48° 44' 05", 16° 59' 45", 7268, pool (30. IX. 1997, LB); **103** – 48° 44' 10", 16° 59' 25"; 7268, canal (10. IX. 1997, LB+MH), **104** – 48° 44' 10", 16° 59' 40"; 7268, pool (10. IX. 1997, LB+MH), **105** – 48° 44' 20", 16° 59' 45"; 7268, pool (8. IX. 1997, LB); **106** – 48° 41' 20", 16° 59' 40"; 7368, Morava r. (21. X. 1996, LB); **107** – 48° 44' 10", 17° 01' 00"; 7268, Jizda c. (8. IX. 1997, LB); **108** – 48° 44' 10", 17° 00' 40", 7268, Jizda c. (20. X. 1996, LB); **109** – 48° 44' 15", 17° 00' 15", 7268, canal (8. IX. 1997, LB); **110** – 48° 44' 25", 17° 00' 50"; 7268, small c. (8. IX. 1997, LB); **111** – 48° 44' 30", 17° 00' 30", 7268, canal (30. IX. 1997, LB); **112** – 48° 44' 35", 16° 59' 45"; 7268, canal (10. IX. 1997, LB+MH), **113** – 48° 44' 40", 16° 59' 10", 7267, Kyjovka r. (8. IX. 1997, LB), **114** – 48° 44' 45", 16° 59' 55", 7268, canal (30. IX. 1997, LB), **115** – 48° 44' 40", 17° 00' 10", 7268, large po. (Stibůrkovská jezera) (30. IX. 1997, LB); **116** – 48° 44' 45", 17° 00' 45", 7268, canal (30. IX. 1997, LB); **117** – 48° 44' 55", 17° 00' 20"; 7268, pool (30. IX. 1997, LB), **118** – 48° 45' 00", 17° 00' 10", 7268, large po. (Stibůrkovská jezera) (30. IX. 1997, LB); **119** – 48° 45' 05", 17° 01' 00", 7268, canal (30. IX. 1997, LB); **120** – 48° 45' 15", 17° 01' 55"; 7268, pool (Rýnava) (30. IX. 1997, LB); **121** – 48° 46' 15", 16° 58' 05"; 7267, Svodnice c. (10. IX. 1997, LB+MH), **122** – 48° 46' 15", 17° 03' 15"; 7268, large po. (1. X. 1997, LB), **123** – 48° 46' 25", 17° 03' 20"; 7268, large po. (1. X. 1997, LB); **124** – 48° 46' 35", 17° 03' 15", 7268, canal (1. X. 1997, LB), **125** – 48° 46' 50", 17° 02' 10", 7268, canal (1. X. 1997, LB), **126** – 48° 47' 40", 17° 02' 30", 7168, sandpit (27. VIII. 1997, LB); **127** – 48° 47' 50", 17° 02' 20"; 7168, Kyjovka c. (27. VIII. 1997, LB), **128** – 48° 47' 55", 17° 04' 50"; 7268, canal (1. X. 1997, LB), **129** – 48° 48' 05", 17° 05' 10", 7168, canal and pool (20. IX. 1997, LB), **130** – 48° 48' 10", 17° 05' 10"; 7168, canal (1. X. 1997, LB); **131** – 48° 48' 10", 17° 05' 40", 7168, large po. (1. X. 1997, LB), **132** – 48° 48' 55", 17° 05' 50", 7168, canal (1. X. 1997, LB); **133** – 48° 50' 35", 17° 05' 25", 7168, Kyjovka r. (7. IX. 1997, LB); **134** – 48° 50' 00", 17° 05' 30", 7168, small p. (2. X. 1997, LB); **135** – 48° 51' 05", 17° 05' 20", 7168, Písečenský rybník p. (2. X. 1997, LB); **136** – 48° 51' 50", 17° 04' 20", 7168, Novodvorský rybník p. (2. X. 1997, LB), **137** – 48° 52' 25", 17° 04' 45"; 7168, small p. (2. X. 1997, LB), **138** – 48° 53' 20", 17° 03' 40"; 7168, small p. (2. X. 1997, LB), **139** – 48° 54' 10", 17° 03' 30"; 7168, Zbrodský rybník p. (2. X. 1997, LB); **140** – 48° 50' 45", 17° 07' 20", 7168, Stará Morava c. (27. VIII. 1997, LB); **141** – 48° 50' 35", 17° 08' 40"; 7168, Morava r. (27. VIII. 1997, LB), **142** – 48° 52' 40", 17° 14' 30"; 7169, Morávka c. (19. IX. 1997, MH), **143** – 48° 54' 15", 17° 12' 45"; 7069, Soboňky p. (7. IX. 1997, LB), **144** – 48° 54' 50", 17° 12' 05"; 7069, Ratiškovický potok b. (19. IX. 1997, MH), **145** – 48° 57' 50", 17° 09' 20", 7068, Písečný rybník p. (29. VIII. 1997, LB); **146** – 48° 54' 20", 17° 19' 20"; 7069, Morávka c. (19. IX. 1997, MH), **147** – 48° 54' 20", 17° 21' 00"; 7070, Velička r. (19. IX. 1997, MH), **148** – 48° 50' 40", 17° 19' 10"; 7070, Velička r. (19. IX. 1997, MH); **149** – 48° 55' 55", 17° 19' 45"; 7069, Morava r. (and 2 canals) (5. IX. 1997, LB); **150** – 48° 57' 20", 17° 23' 10", 7070, Morava r. (26. VIII. 1997, LB), **151** – 48° 57' 25", 17° 22' 50", 7070,

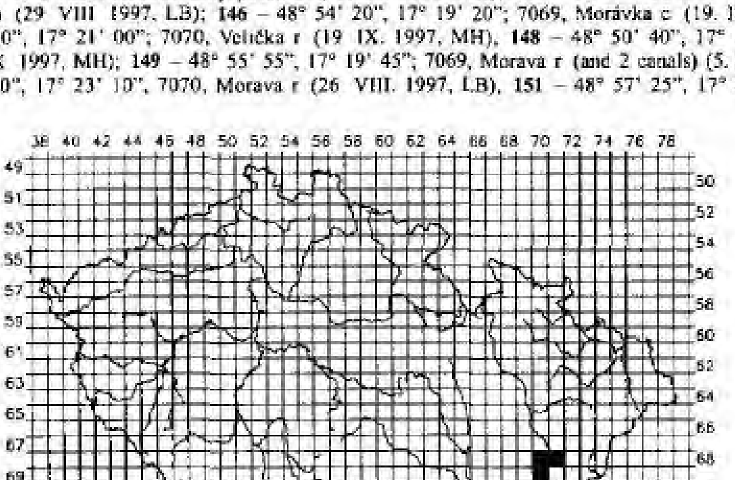

Fig. 1. Map of the Czech Republic with mapping squares of area studied

canal (and other smaller canal) (26 VIII 1997, LB), **152** – 48° 58' 25", 17° 24' 20", 7070, Svodnice c (18 IX 1997, MH), **153** – 48° 58' 45", 17° 19' 40", 7069, marsh (28 VIII 1997, LB), **154** – 48° 59' 25", 17° 21' 10", 7070, canal (18 IX 1997, MH), **155** – 48° 59' 30", 17° 23' 50", 7070, Morava r (29 VIII 1997, LB), **156** – 48° 59' 45", 17° 27' 20", 7070, pond (18 IX 1997, MH), **157** – 49° 00' 45", 17° 22' 35", 6970, canal (18 IX 1997 MH), **158** – 49° 00' 55", 17° 23' 55", 6970, pool (18 IX 1997, MH), **159** – 49° 01' 10", 17° 25' 45", 6970, sandpit (20 IX 1997, MH), **160** – 49° 00' 40" 17° 27' 00", 6970, small c (18 IX 1997, MH), **161** – 49° 01' 40", 17° 28' 00", 6970, Petřikovec b (18 IX 1997, MH), **162** – 49° 02' 45", 17° 25' 50", 6970, Olšava r (18 IX 1997, MH), **163** – 49° 03' 15", 17° 25' 00", 6970, Zlechovky potok b (18 IX 1997, MH), **164** – 49° 07' 15", 17° 30' 10", 6870, pools, canals and small brooks (28 VIII 1997, LB), **165** – 49° 08' 05", 17° 30' 45", 6871 Morava r (28 VIII 1997, LB)

HISTORY OF INVESTIGATION

First data on the aquatic molluscs from the area investigated are recorded from the end of the 19th century by Uličny (1885), who studied the area in 1882 Klvaňa (1885) studied area near Uherské Hradiště and Hodonín, but published only finding of *Theodoxus danubialis* His collection were revised by Hudec (1962) Other data from the end of the 19th century were published by Rzehak (1891), Uličny (1889 and 1896) and Schierl (1901) Important data from the beginning of this century were published by Zimmermann (1916) The most important data after World War II were published by Hudec (1962) Some data were found in collection in the National Museum in Prague (material collected by J Brabenec) Research from last 30 years directed to aquatic molluscs has been as follows Kotolanova 1971, Balůsek & Vojtek 1973, Ditrich & Vojtek 1977, Halouzka 1977, Coufalova 1991

A survey of the published data

Data in the survey are as follows – name of species, name and localization of the locality (r – river, c – canal, p – pond, ps – ponds, po – pool, pos – pools, b – brook, vill – village, f ft – floodplain forest, NMP – National Museum Praha) code of the mapping square for faunistic mapping according to Buchar (1982), citation of the source group of date from the same source have citation after last date of group (published data were not revised in collections)

Theodoxus danubialis – Morava r – Uherske Hradiště (6970) (Klvaňa 1885), Dyje r – Šakvice (7166) (lgt Schierl, Uličny 1896), Morava r – Uherske Hradiště (6970), Dyje r – Dolni Věstonice (7165) (Schierl 1901), Dyje r – Dolni Věstonice (7165) (lgt Brabenec, coll NMP)

Viviparus contectus – Hodonin (7168), Strachotin (7165), Dolni Věstonice (7165) (Schierl 1901), pos near Lednice (7166) (Zimmermann 1916), f ft Skařina near vill Mikulčice (7168) (Ložek 1959) pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970), f ft Kolibky to the south of vill Nedakonice (6970), swamps and meadows to the south of Moravsky Pisek (7070), wetlands near Bzenec (7069), Pisečny rybnik p near Milotice (7068), pos to the north of vill Vacenovice (7068) wetlands between vill Milotice and Mistřin (7068), f ft to the south from Hodonin (7168), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), pos near vill Strachotin (7165), c near the village Lednice (7166) (Kotolanova 1971), pos near vill Dolni Věstonice (7165), pos near Podivin (7167), po near vill Pouzdřany (7065), po near Poštorna (7267), po near vill Strachotin (7165) (Balůsek & Vojtek 1973), Bile jezirko po near vill Mušov (7165) (Halouzka 1977), po near Podivin (7167), c near vill Lednice (7166), po near vill Bulhary (7166), po near vill Přitluky (7166), po near vill Mušov (7165) Marianske jezero po near vill Dolni Věstonice (7165), pos near vill Strachotin (7165) (Ditrich & Vojtek 1977), po near Podivin (7167) (Ševčikova 1990)

Viviparus acerosus – Dyje r – Dolni Věstonice (7165) (Uličný 1885), vill Pouzdřany (7065), Přitluky (7166) and Dolni Vestonice (7165) (Schierl 1901), po near vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolni Věstonice (7165) (lgt Brabenec, coll NMP), vill Lednice (7166) (lgt Brabenec, coll NMP), f ft to the south from Hodonin (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), arm of Dyje r near vill Bulhary (7166), po near vill Přitluky (7166) (Ditrich & Vojtek 1977)

Lithoglyphus naticoides – Dyje r – Dolni Věstonice (7165) (lgt Rzehak, Uličny 1885), Morava r – Hodonin (7168) (lgt Beranek, Uličny 1896), vill Pouzdřany (7065), Přitluky (7166) and Dyje r – Dolni Věstonice (7165) (Schierl 1901), Dyje r – Lednice (7166) (Zimmermann 1916), Dyje r – Dolni Věstonice (7165) (lgt Brabenec 1956, coll NMP), arm of Dyje r near vill Lednice (7166) (Kroupa 1974), Dyje r – Dolni Věstonice (7165) (Ditrich & Vojtek 1977)

Bithynia tentaculata – vill. Strachotin (7165) (Uličny 1896), vill. Pouzdřany (7065), vill. Strachotin (7165) (Schierl 1901), Lednicke rybniky ps. (7266) (Zimmermann 1916), Dyje r. – Dolni Věstonice (7165) (lgt. Brabenec 1956, 1958, coll. NMP), vill. Lednice (7165) (lgt. Brabenec 1958, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), forest between vill. Babice and Kněžpol (6871), swamp Olšı to the east of vill. Huštěnovice (6870), f. ft. Kopřivna between Uherske Hradiště and vill. Kostelany (6970), f. ft. Kobliky to the south from vill. Nedakonice (6970), swamps and meadows to the south from Moravsky Pisek (7070), wetlands near Bzenec (7069), Písečný rybnik p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřin (7068), f. ft. to the south from Hodonin (7168), f. ft. near vill. Mikulčice (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), c. near vill. Lednice (7166) (Kotolanova 1971), vill. Lednice (7166), pos. near Podivin (7167), po. near vill. Pouzdřany (7065), po. near Poštorna (7267), po. near vill. Strachotin (7165) (Balůsek & Vojtek 1973), Bile jezirko po. near vill. Mušov (7165) (Halouzka 1977), po. near Podivin (7167), po. near vill. Mušov (7165), Marianske jezero po. near vill. Dolni Věstonice (7165) (Ditrich & Vojtek 1977), po. near Podivin (7167) (Ševčikova 1990)

Bithynia leachii – c. near vill. Lednice (7165) (Kotolanova 1971), vill. Lednice (7165) (Balůsek & Vojtek 1973), c. near vill. Lednice (7165) (Ditrich & Vojtek 1977), Nesyt and Hlohovecky rybnik ps. (7266) (Coufalova 1991)

Valvata cristata – pos. between vill. Babice and Spytihněv (6870, 6871), swamp Olšı to the east of vill. Huštěnovice (6870), wetlands near Bzenec (7069), Písečný rybnik p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), po. near vill. Mušov (7165), Marianske jezero po. near vill. Dolni Věstonice (7165) (Ditrich & Vojtek 1977)

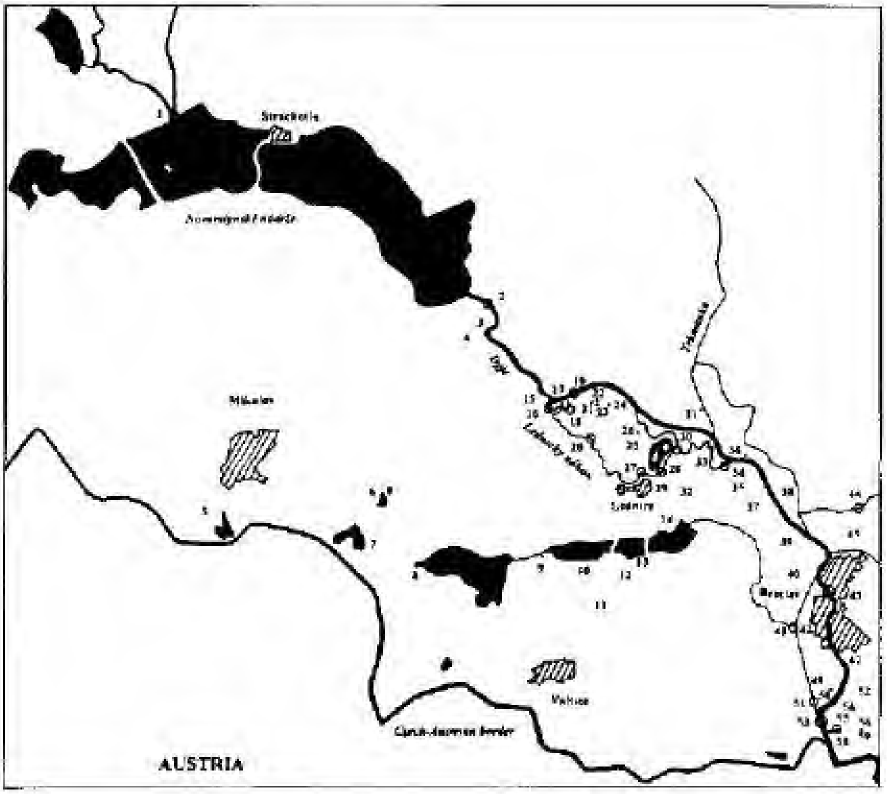

Fig. 2. Map of the studied area with investigated localities

Valvata piscinalis – vill Strachotin (7165) (Uličný 1885), vill Strachotín (7165), Přítluky (7166) and Dolni Věstonice (7165) (Schierl 1901), *Prostřední and Hlohovecky rybník ps (7266), Nesyt p (7266), po near vill* Lednice (7165) (Zimmermann 1916), the Dyje River – Dolni Věstonice (7165) (lgt Brabenec 1956, coll NMP), vill Lednice (7166) (lgt Brabenec 1958, coll NMP), Nesyt p (7266) (lgt Brabenec 1968, coll NMP), swamp Olši to the east of vill Huštěnovice (6870) pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), Bile jezirko po near vill Mušov (7165) (Halouzka 1977), po near Podivin (7167), po near vill Mušov (7165), Mariánske jezero po near vill Dolni Věstonice (7165) (Ditrich & Vojtek 1977), Nesyt p (7166) (Coufalová 1991)

Acroloxus lacustris – *Prostřední rybník p (7166) (Zimmermann 1916), Dyje r – Dolni Věstonice (7265) (lgt* Brabenec 1956, coll NMP), vill Lednice (7166) (lgt Brabenec 1958, coll NMP), pos between vill Babice and Spytihněv (6870, 6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970), f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Pisek (7070), Pisečny rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), pool near vill Mušov (7165) (Ditrich & Vojtek 1977)

Lymnaea truncatula – Prostřední rybník p and Nesyt p *(7266) (Zimmermann 1916), Dyje r – Dolni Věstonice (7165)* (lgt Brabenec 1956, coll NMP), f ft Skařina near vill Mikulčice (7168) (Ložek 1959), pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherské Hradiště and vill Kostelany (6970), f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Pisek (7070), wetlands near Bzenec (7069), Pisečny rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřin (7068), f ft to the south from Hodonin (7168), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanžhot (7267), f ft *Pohansko to the south from Břeclav (7267) (Hudec 1962), pos near Podivin (7167), Dyje r – Dolní Věstonice (7165)* (Ditrich & Vojtek 1977), po near Podivin (7167) (Ševčiková 1990)

Lymnaea peregra* f. *peregra – Lednicke rybniky ps (7266) (Zimmermann, 1916), (Dyje r – Dolni Věstonice (7165) (lgt Brabenec 1956, coll NMP), Nesyt p (7266) (lgt Brabenec 1968, coll NMP), swamp Olši to the east of vill Huštěnovice (6870), wetlands near Bzenec (7069), Pisečny rybník p near Milotice (7068, Hudec 1962), pos near vill Strachotin (7165), c near vill Lednice (7166) (Kotolanova 1971), po near vill Lednice (7165), po near vill Mušov (7065), Nesyt p (7266), po near Podivin (7167) (Ševčiková 1990), Prostřední rybník p and Nesyt p *(7266) (Coufalova 1991)*, ***Lymnaea peregra* f. *ovata*** *– vill Strachotin (7165), Dolni Věstonice (7165) and* Hodonin (7168, Schierl 1901), pos near vill Rakvice (7166) (Zimmermann, 1916), Dyje r – Dolni Věstonice (7165) (lgt Brabenec 1956, coll NMP), Pisečny rybník p near Milotice (7068), wetlands between vill Milotice and Mistřin (7068) (Hudec 1962), pos near vill Strachotin (7165), c near vill Lednice (7166) (Kotolanova 1971), po near vill Dolni Věstonice (7165), po near vill Lednice (7166), Prostřední rybník p (7266), pos near Podivin (7167), po near vill Strachotin (7165) (Balůsek, Vojtek 1973), pos near vill Mušov (7165) (Halouzka 1977), po near Podivin (7167), c near vill Lednice (7166), po near vill Bulhary (7166), arm of Dyje r near vill *Mušov (7165), Marianske jezero po near vill Dolni Věstonice (7165), pos near vill Strachotin (7165) (Ditrich* & Vojtek 1977), Nove Mlyny reservoir near vill Mušov (7065), po near vill Lednice (7166) (Ševčikova 1990), Hlohovecky rybník p and Nesyt p (7266) (Coufalová 1991), ***Lymnaea peregra* f. *ampla*** – Hodonin (7168) (Schierl 1901), f ft Pohansko near Břeclav (7267) (Hudec 1962)

Lymnaea auricularia – Hodonin (7168), vill Dolni Věstonice (7165), Pouzdřany (7065) and Přítluky (7166) (Schierl 1901), Lednicke rybniky ps (7266) (Zimmermann 1916), Dyje r – Dolni Věstonice (7165) (lgt Brabenec 1956, coll NMP), vill Lednice (7166) (lgt Brabenec 1958, coll NMP), Nesyt p (7266) (lgt Brabenec 1968, coll NMP), pos between vill *Babice and Spytihněv (6871), Pisečny rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068)*, wetlands between vill Milotice and Mistřin (7068), f ft to the south from Hodonin (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), po near vill Mušov (7165) (Halouzka 1977), Dyje r – Dolni Věstonice (7165), arm of Dyje r near vill Mušov (7165) (Ditrich & Vojtek 1977), Nove Mlyny reservoir near vill Mušov (7165) (Ševčikova 1990)

Lymnaea palustris agg – Hodonin (7168), village Strachotin (7165) (Schierl 1901), pos near vill Lednice (7166) (Zimmermann 1916), pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), *swamp Olši to the east from vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970)* f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Pisek (7070), wetlands near Bzenec (7069), Pisečny rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřin (7068), f ft to the south from Hodonin (7168), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), pos near vill Strachotin (7165), po near vill Lednice (7166) (Kotolanová 1971), vill Dolni Věstonice (7165), po near vill Pouzdřany (7065), po near village Strachotin (7165) (Balůsek & Vojtek 1973), Bile jezirko po near vill Mušov (7165) (Halouzka 1977), *po near Podivin (7167), Nesyt p (7266) (Ševčikova 1990), Nesyt p (7266) (Coufalova 1991)*

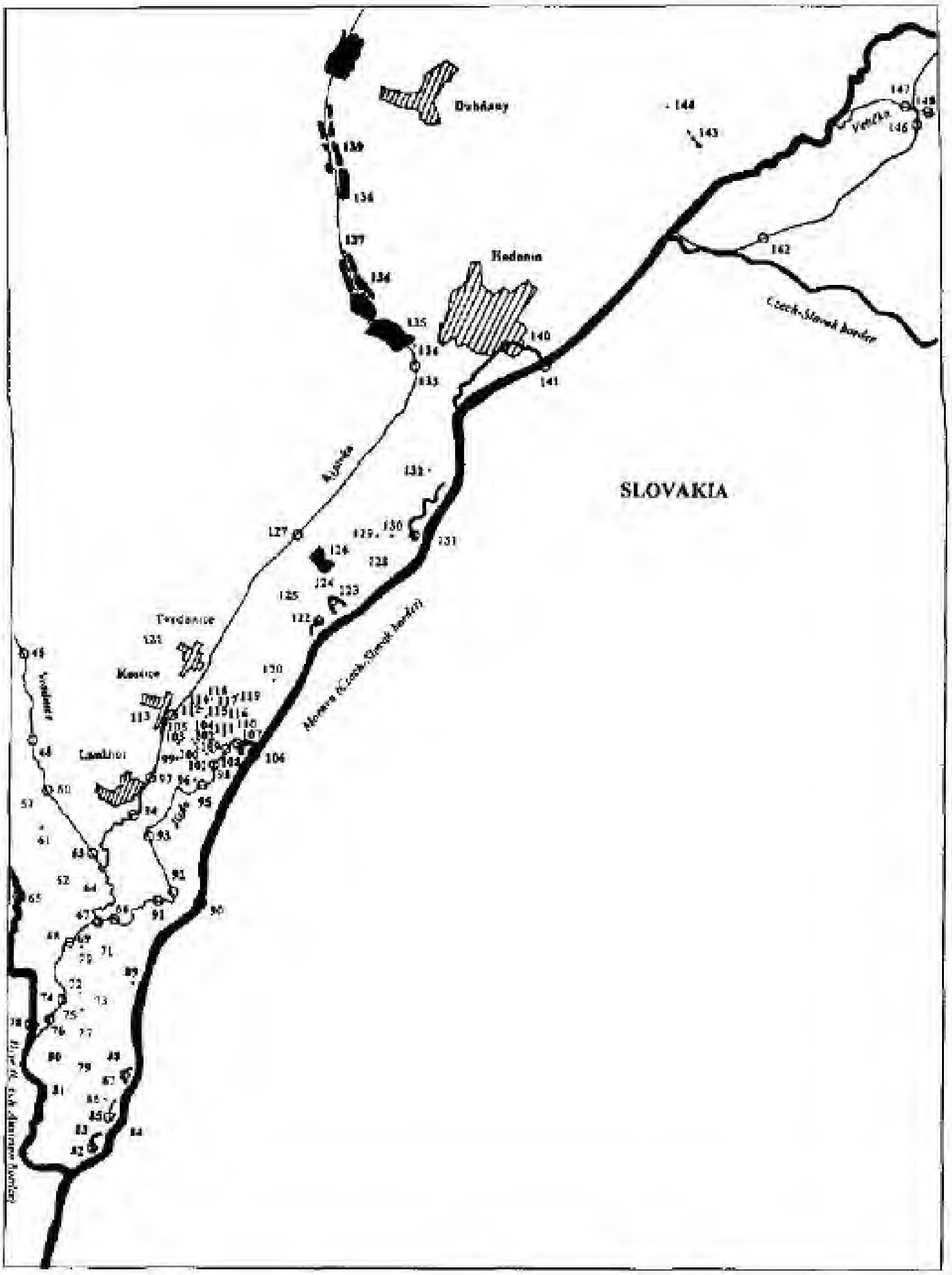

Fig. 3 Map of the studied area with investigated localities

Lymnaea stagnalis – vill Přítluky (7166), vill Strachotín (7165) (Schierl 1901), Prostřední rybník p (7266), pos near vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970) f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Písek (7070), wetlands near Bzenec (7069), Písečný rybník p near Milotice (7068), po to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřín (7068), f ft to the south from Hodonín (7168), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), pos near vill Strachotín (7165), c near vill Lednice (7166) (Kotolanova 1971), vill Dolní Věstonice (7165), Dyje r – Dolní Věstonice (7165), po near vill Lednice (7166), Prostřední rybník p (7266), pos near Podivín (7166) po near Poštorna (7267), po near vill Strachotín (7165) (Balůsek & Vojtek 1973), Bíle jezírko po near vill Mušov (7165) (Halouzka 1977), po near Podivín (7167), Mlynsky rybník p (7266) arm of Dyje r near vill Bulhary (7166), po near vill Mušov (7165), Marianske jezero po near vill Dolní Věstonice (7165), pos near vill Strachotín (7165) (Ditrich & Vojtek 1977), p on the Allah b (7266), po near vill Lednice (7166), Nesyt p (7266), po between vill Lednice and Podivín (7166), po near vill Podivín (7166) (Ševčikova 1990) Lednicke rybníky ps (7266) (Coufalova 1991)

Planorbis planorbis – vill Pouzdřany (7065), vill Dolní Věstonice (7165), vill Přítluky (7166) (Schierl 1901), Prostřední rybník p (7266), pos near vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), f ft Skařina near vill Mikulčice (7168) (Ložek 1959), pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970), f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Písek (7070), wetlands near Bzenec (7069), Písečný rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřín (7068), f ft to the south from Hodonín (7168), f ft near vill Mikulčice (7168), po between vill Kostice and Lanžhot (7267), f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), pos near vill Strachotín (7165), c near vill Lednice (7166) (Kotolanova 1971), vill Dolní Věstonice (7165), Dyje r – Dolní Věstonice (7165), po near vill Lednice (7166), pos near Podivín (7166), po and p near vill Pouzdřany (7065), po near Poštorná (7267), po near vill Strachotín (7165) (Balůsek & Vojtek 1973), Bíle jezírko po near vill Mušov (7165) (Halouzka 1977), po near Podivín (7167), c near vill Lednice (7166), po near vill Mušov (7165), Mariánske jezero po near vill Dolní Věstonice (7165), pos near vill Strachotín (7165) (Ditrich & Vojtek 1977), po near vill Lednice (7166), Nesyt p (7266), po near vill Podivín (7166) (Ševčikova 1990), Nesyt Pond (7266) (Coufalova 1991)

Planorbis carinatus – Písečný rybník p near vill Milotice, pos to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřín (7068) (Hudec, 1962), po near vill Podivín (7166) (Ševčikova 1990)

Anisus spirorbis – vill Strachotín (7165), vill Dolní Věstonice (7165) (Schierl 1901), Nesyt p (7266), pos near vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), f ft Skařina near vill Mikulčice (7168) (Ložek 1959), pos between vill Babice and Spytihněv (6870, 6871), forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970), f ft Kolibky to the south from vill Nedakonice (6970), swamps and meadows to the south from Moravsky Písek (7070), wetlands near Bzenec (7069), Písečný rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068), wetlands between vill Milotice and Mistřín (7068) f ft to the south from Hodonín (7168), f ft near vill Mikulčice (7168), pos between vill Kostice and Lanzhot (7267) f ft Pohansko to the south from Břeclav (7267) (Hudec 1962), po near vill Pouzdřany (7065) (Balůsek & Vojtek 1973) po near Podivín (7166) (Ditrich & Vojtek 1977)

Anisus leucostoma – vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), Nesyt p (7266) (lgt Brabenec 1968, coll NMP), pos between vill Babice and Spytihněv (6870, 6871), Písečný rybník p near Milotice (7068), pos to the north from vill Vacenovice (7068) (Hudec 1962)

Anisus vortex – pos near vill Lednice (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), vill Lednice (7166) (lgt Brabenec 1958, coll NMP), pos between vill Babice and Spytihněv (6870, 6871) forest between vill Babice and Kněžpol (6871), swamp Olši to the east of vill Huštěnovice (6870), f ft Kopřivna between Uherske Hradiště and vill Kostelany (6970), f ft Kolibky to the south from vill Nedakonice (6970), wetlands near Bzenec (7069) (Hudec 1962), po near vill Lednice (7166) (Balůsek & Vojtek 1973) po near vill Mušov (7165) (Halouzka 1977), po near Podivín (7166), po near vill Mušov (7165), pos near vill Strachotín (7165 Ditrich & Vojtek 1977)

Anisus vorticulus – po between vill Lednice and Podivín (7166) (Zimmermann 1916), Dyje r – Dolní Věstonice (7165) (lgt Brabenec 1956, coll NMP), pos between vill Babice and Spytihněv (6870, 6871), swamp Olši to the east of vill Huštěnovice (6870), swamps and meadows to the south from Moravsky Písek (7070),

wetlands near Bzenec (7069), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068) (Hudec 1962), po. near vill. Lednice (7166) (Kotolanová 1971), po. near vill. Mušov (7165) (Halouzka 1977).

Bathyomphalus contortus – pos. between vill. Babice and Spytihněv (6870, 6871), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřín (7068), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962).

Gyraulus albus – Prostřední rybník p. (7266), po. near Podivín (7166), po. near vill. Lednice (7166) (Zimmermann 1916), Dyje r. – Dolní Věstonice (7165) (lgt. Brabenec 1956, coll. NMP), vill. Lednice (7166) (lgt. Brabenec 1958, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), the swamp Olší to the east of vill. Huštěnovice (6870), wetlands near Bzenec (7069), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068) (Hudec 1962), po. near vill. Mušov (7165) (Halouzka 1977), po. near vill. Lednice (7166), Mariánské jezero po. near vill. Dolní Věstonice (7165), Vrkoč p. (7065) (Ditrich & Vojtek 1977), po. near Podivín (7166) (Ševčíková 1990).

Gyraulus laevis – Prostřední rybník p. and Nesyt p. (7266) (Zimmermann 1916), Písečný rybník p. near the vill. Milotice (7068) (Hudec 1962).

Gyraulus crista – Lednické rybníky ps. (7266), pos. on Allah b. (7266) (Zimmermann 1916), Nesyt p. (7266) (lgt. Brabenec 1968, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), swamp Olší to the east of vill. Huštěnovice (6870), swamps and meadows to the south from Moravský Písek (7070), wetlands near Bzenec (7069), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), f. ft. near vill. Mikulčice (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), po. near Podivín (7166) (Ditrich & Vojtek 1977).

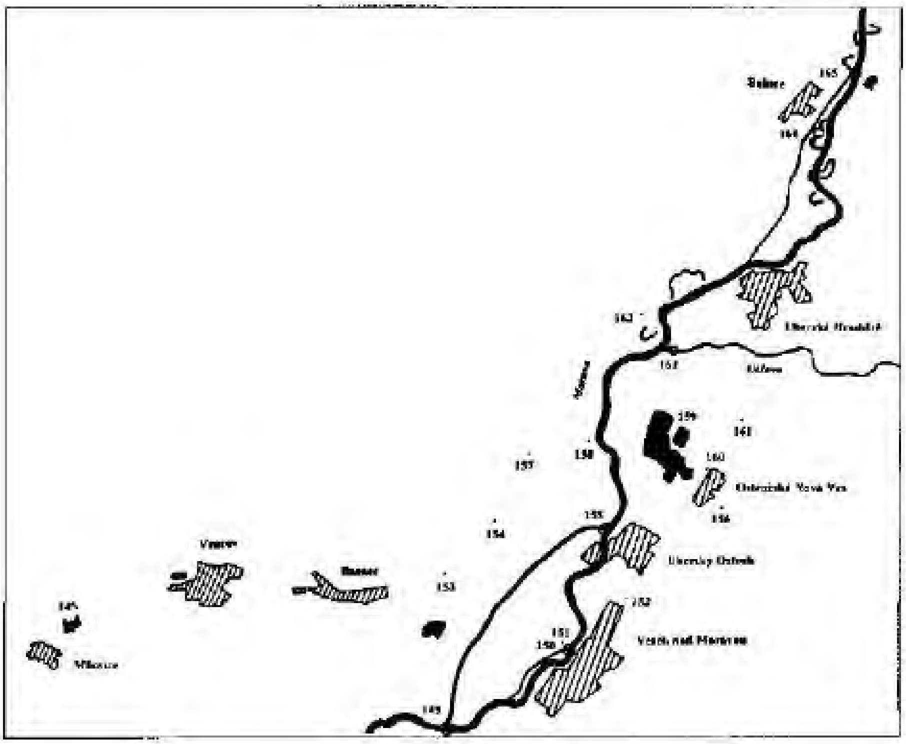

Fig. 4. Map of the studied area with investigated localities.

Hippeutis complanatus – vill. Lednice (7166) (Zimmermann 1916), Nesyt p. (7266) (lgt. Brabenec 1958, coll. NMP), the village Lednice (7166, lgt. Brabenec 1968, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), swamp Olši to the east of vill. Huštěnovice (6870) (Hudec 1962)

Segmentina nitida – Prostřední rybník p. (7266), pos. between vill. Lednice and Valtice (7266) (Zimmermann, 1916), pos. between vill. Babice and Spytihněv (6870, 6871), wetlands near Bzenec (7069), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřín (7068), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), po. near vill. Lednice (7166) (Kotolanová 1971), po. near vill. Lednice (7166), pos. near Podivín (7166) (Balůsek & Vojtek 1973), po. near Podivín (7166) (Ditrich & Vojtek 1977)

Planorbarius corneus – Hodonín (7168), vill. Strachotín (7165) (Schierl 1901), pos. and ps. near vill. Lednice *(7166) (Zimmermann 1916), Dyje r. – Dolní Věstonice (7165) (lgt. Brabenec 1956, coll. NMP), f. ft. Skařina* near vill. Mikulčice (7168) (Ložek 1959), pos. between vill. Babice and Spytihněv (6870, 6871), forest between vill. Babice and Kněžpol (6871), swamp Olši to the east of vill. Huštěnovice (6870), f. ft. Kopřivna between Uherské Hradiště and vill. Kostelany (6970), f. ft. Kolibky to the south from vill. Nedakonice (6970), swamps and meadows to the south from Moravský Písek (7070), wetlands near Bzenec (7069), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřín (7068), f. ft. to the south from Hodonín (7168), f. ft. near vill. Mikulčice (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), pos. near vill. Strachotín (7165), c. near vill. Lednice (7166) (Kotolanová 1971), vill. Dolní Věstonice (7165), po. near vill. Lednice (7166), pos. near Podivín (7166), po. near vill. Pouzdřany (7065), po. near vill. Strachotín (7165) (Balůsek & Vojtek 1973), Bílé jezírko po. near vill. Mušov (7165) (Halouzka 1977), c. near vill. Lednice (7166), po. near vill. Mušov (7165), Mariánské jezero po. near vill. Dolní Věstonice (7165), pos. near vill. Strachotín (7165), Vrkoč p. (7065) (Ditrich & Vojtek 1977), po. near vill. Podivín (7166), po. near vill. Lednice (7166) (Ševčíková 1990), Mlýnský rybník p. (7266) (Coufalová 1991)

Ancylus fluviatilis – Hodonín (7168) (Uličný 1889)

Physa fontinalis – vill. Strachotín (7165) (Rzehak 1891), vill. Strachotín (7165), pos. near vill. Rakvice (7166), vill. Lednice (7166) (Zimmermann 1916), Dyje r. – Dolní Věstonice (7165) (lgt. Brabenec 1956, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), swamp Olši to the east of vill. Huštěnovice (6870), f. ft. Kopřivna between Uherské Hradiště and vill. Kostelany (6970), f. ft. Kolibky to the south from vill. Nedakonice (6970), f. ft. to the south from Hodonín (7168), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), c. and po. near vill. Lednice (7166) (Kotolanová 1971), po. near vill. Lednice (7166), po. near Podivín (7166) (Balůsek & Vojtek 1973), po. near vill. Mušov (7165) (Halouzka 1977), po. near Podivín (7166), po. near vill. Mušov (7165), Mariánské jezero p. near vill. Dolní Věstonice (7165) (Ditrich & Vojtek 1977), Hlohovecký rybník p. (7266) (Coufalová 1991)

Physella acuta – *wetlands near Bzenec (7069), Písečný rybník p. near vill. Milotice (7068) (Hudec 1962)*, po. near vill. Lednice (7166) (Balůsek & Vojtek 1973)

Aplexa hypnorum – Nesyt p. (7266) (lgt. Brabenec 1968, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), wetlands near Bzenec (7069), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), po. near vill. Lednice (7166) (Kotolanová 1971), pos. near vill. Dolní Věstonice (7165) (Balůsek & Vojtek 1973), po. near vill. Mušov (7165), po. near vill. Strachotín (7165) (Ditrich & Vojtek 1977)

Unio pictorum – vill. Strachotín (7165) (Uličný 1885), vill. Přítluky (7166), vill. Strachotín (7166) (Schierl 1901), Dyje r. near vill. Lednice (7166), Zámecký rybník p. and Růžový rybník p. (7166) (Zimmermann 1916), pos. between vill. Babice and Spytihněv (6870, 6871), f. ft. Kolibky to the south from vill. Nedakonice (6970), swamps and meadows to the south from Moravský Písek (7070), f. ft. to the south from Hodonín (7168), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje r. near vill. Lednice (7166) (Kroupa 1974)

Unio tumidus – pos. between vill. Babice and Spytihněv (6870, 6871), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje r. near vill. Lednice (7166) (Kroupa 1974)

Unio crassus – Dyje r. near vill. Lednice (7166) (Zimmermann 1916), pos. between vill. Babice and Spytihněv (6870, 6871), f. ft. Kolibky to the south from vill. Nedakonice (6970), f. ft. to the south from Hodonín (7168), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje r. near vill. Lednice (7166) (Kroupa 1974)

Anodonta cygnea – Strachotín (7165) (Schierl 1901), Růžový rybník p. near vill. Lednice (7166) (Zimmermann 1916), pos. between vill. Babice and Spytihněv (6870, 6871), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje r. near vill. Lednice (7166) (Kroupa 1974), po. near vill. Mušov (7165) (Halouzka 1977)

Anodonta anatina – Prostřední and Hlohovecký rybník ps. (7266) (Zimmermann 1916), pos. between vill. Babice and Spytihněv (6870, 6871), f. ft. Kolibky to the south from vill. Nedakonice (6970), f. ft. to the south from Hodonín (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje r. near vill. *Lednice (7166) (Kroupa 1974)*

Pseudanodonta complanata – Zámecký rybník p. near vill. Lednice (7166) (Zimmermann 1916), pos. between vill. *Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), Dyje* r. near vill. Lednice (7166) (Kroupa 1974).

Sphaerium corneum – vill. Přítluky (7166) (Schierl 1901), Nesyt and Hlohovecký rybník ps. (7266) (Zimmermann 1916), pos. between vill. Babice and Spytihněv (6870, 6871), forest between vill. Babice and Kněžpol (6871), swamp Olši to the east of vill. Huštěnovice (6870), f. ft. Kopřivna between Uherské Hradiště and vill. Kostelany (6970), f. ft. Kolibky to the south from vill. Nedakonice (6970), swamps and meadows to the south from Moravský Písek (7070), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřín (7068), f. ft. to the south from Hodonín (7168), f. ft. near vill. Mikulčice (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962).

Sphaerium rivicola – Hodonín (7168), Dyje r. – Dolní Věstonice and Strachotín (7165) (Schierl 1901), Dyje r. near vill. Lednice (7166) (Zimmermann 1916), vill. Lanžhot (7267), Olšava r. – Veletiny (6971) (lgt. Krause 1930, coll. NMP), Dyje r. – Dolní Věstonice (7165, lgt. Brabenec 1956, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), f. ft. Kopřivna between Uherské Hradiště and vill. Kostelany (6970), f. ft. Kolibky to the south from vill. Nedakonice (6970), swamps and meadows to the south from Moravský Písek (7070), Písečný rybník p. near Milotice (7068), pos. to the north from vill. Vacenovice (7068), wetlands between vill. Milotice and Mistřín (7068), f. ft. to the south from Hodonín (7168), f. ft. near vill. Mikulčice (7168), pos. between vill. *Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962), arm of Dyje r. near* vill. Lednice (7166) (Kroupa 1974).

Musculium lacustre – Strachotín (7165) (Schierl 1901), Nesyt p. (7266), wetlands near vill. Lednice (7166) (Zimmermann 1916), Dyje River – Dolní Věstonice (7165) (lgt. Brabenec 1956, coll. NMP), Nesyt p. (7266) (lgt. Brabenec 1968, coll. NMP), pos. between vill. Babice and Spytihněv (6870, 6871), swamp Olši to the east of vill. Huštěnovice (6870), f. ft. Kolibky to the south from vill. Nedakonice (6970), wetlands between vill. Milotice and Mistřín (7068), f. ft. to the south from Hodonín (7168), f. ft. near vill. Mikulčice (7168) (Hudec 1962), c. near vill. Lednice (7166) (Kotolanová 1971)

Pisidium amnicum – Hodonín (7168) (Schierl 1901), f. ft. Kolibky to the south from vill. Nedakonice (6970), f. ft. to the south from Hodonín (7168), f. ft. near vill. Mikulčice (7168) (Hudec 1962)

Pisidium subtruncatum – Písečný rybník p. near vill. Milotice (7068) (Hudec 1962).

Pisidium supinum – Dyje r. – Dolní Věstonice (7165) (lgt. Brabenec 1965, coll. NMP), f. ft. to the south from Hodonín (7168) (Hudec 1962)

Pisidium obtusale – swamp Olši to the east of vill. Huštěnovice (6870), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962)

Pisidium casertanum – Strachotín (7165) (Uličný 1885), Strachotín (7165) (Schierl 1901), swamp Olši to the east of vill. Huštěnovice (6870), swamps and meadows to the south from Moravský Písek (7070), wetlands between vill. Milotice and *Mistřín (7068), f. ft.* near vill. Mikulčice (7168), pos. between vill. Kostice and Lanžhot (7267), f. ft. Pohansko to the south from Břeclav (7267) (Hudec 1962).

RESULTS

A survey of molluscs

This chapter includes a survey of the molluscs found, with descriptive notes, e. g., occurrence, density (O – solitary occurrence, R – scattered occurrence (ussually found less than 20 specimens), H – abundant occurrence (found more than 50 specimens), VH – very abundant occurrence (found more than 100 specimens), x only old (subfossil) conchs), and distribution in the Czech Republic.

Gastropoda

Archaeogastropoda

Neritidae

Theodoxus danubialis (C. Pfeiffer, 1828) – was found at loc. No. 74(R), 76(O), 162(xO). The Kyjovka river seems to be the last locality with recent occurrence in the Czech Republic.

Mesogastropoda

Viviparidae

Viviparus contectus (Millet, 1813) – was found at loc No 1(O), 3(O), 4(O), 21(H), 31(R), 32(R), 39(H), 41(O), 48(O), 49(R), 52(H), 55(R), 61(R), 63(R), 64(H), 66(R), 71(R), 73(R), 77(R), 80(O), 82(R), 83(H), 86(R), 88(R), 89(R), 99(R), 100(R), 101(R), 103(R), 104(R), 105(H), 109(R), 110(R), 113(O), 114(R), 115(R), 116(R), 117(R), 118(H), 119(R), 120(R), 125(R), 128(O), 129(VH), 145(R), 146(O), 149(H), 151(H), 155(R)

Viviparus acerosus (Bourguignat, 1862) – was found at loc No 4(xO), 16(H-VH, max density more than 100 individuals/m²), 20(H-VH, max density more than 100 individuals/m²), 27–28(H-VH, max density more than 100 individuals/m²), 30(H), 34(R-H), 35(H), 36(H), 41(R), 42(xO), 43(O), 51(R), 53(O), 58(O), 63(H), 66(O), 67(H), 68(H), 73(xO), 74(R), 76(R), 91(O), 92(O), 94(R), 95(H), 97(H), 98(H), 101(R), 107(O), 108(R-H), 109(R), 113(R) A rare pontic species This species probably lives in the Czech Republic only in the studied area

Hydrobiidae

Lithoglyphus naticoides (C Pfeiffer, 1828) – was found at loc No 20(O), 27(O), 28(H, max density more than 30 individuals/m²), 30(R), 43(O), 48(R), 53(xO), 65(O), 66(H), 67(H), 74(H), 76(R), 78(R), 91(O), 93(O), 94(H-VH, max density more than 100 individuals/m²), 95(H), 97(O), 101(O), 162(xR) A rare pontic species This species probably lives in the Czech Republic only in the studied area

Bithyniidae

Bithynia tentaculata (Linnaeus, 1758) – was found at loc No 1(H), 2(H), 3(H), 4(R), 7(R), 10(R), 16(R), 19(H), 20(R), 21(H), 23(H), 26(H), 27(R), 28(H), 30(R), 31(R), 32(R), 34(R), 36(H), 37(O), 39(R), 40(R), 41(O), 43(R), 46(R), 47(H), 48(H), 50(H), 53(R), 58(R), 60(R), 63(R), 64(R), 65(O), 66(R), 67(R), 71(R), 73(R), 74(R), 76(R), 77(O), 78(O), 79(O), 81(R), 87(O), 88(R), 90(O), 91(R), 92(R), 93(R), 95(H), 97(H), 98(H), 99(O), 100(R), 101(R), 103(O), 104(O), 105(R), 107(R), 108(H), 109(R), 110(R), 112(R), 113(R), 115(R), 116(R), 117(O), 118(R), 119(R), 120(R), 124(O), 126(R), 127(R), 129(H), 131(H), 138(H), 139(R), 140(R), 141(O), 142(VH), 145(H), 146(H), 147(H), 148(O), 149(R), 150(O), 151(VH), 153(H), 155(R), 158(H), 159(R), 164(R), 165(R)

Bithynia leachi (Sheppard, 1823) – was found at loc No 100(R), 101(R), 104(O), 105(R), 115(H), 117(O) A rare palearctic species This species is known in the Czech Republic only from the studied area

Valvatidae

Valvata cristata O F Muller, 1774 – was found at loc No 72(R), 96(R), 105(O), 115(O), 129(H), 145(R), 151(H), 153(R)

Valvata piscinalis (O F Muller, 1774) – was found at loc No 1(R), 2(R), 3(H), 4(R), 9(VH), 16(VH), 20(VH), 27(VH), 28(H), 30(R), 31(R), 32(R), 34(R), 37(O), 43(R), 46(H), 48(R), 58(R), 60(R), 63(R), 64(R), 65(O), 66(R), 67(R), 68(H), 74(R), 76(R), 79(R), 91(R), 92(R), 97(R), 101(R), 107(O), 109(R), 110(O), 113(R), 116(O), 119(R), 127(R), 142(H), 146(R), 147(R), 151(R)

Basommathophora

Acroloxidae

Acroloxus lacustris (Linnaeus, 1758) – was found at loc No 12(R), 16(R), 17(R), 20(R), 23(VH), 24(VH), 27(R), 28(R), 66(R), 74(O), 83(O), 92(O), 95(R), 105(R), 108(R), 129(H), 140(R), 145(R), 146(H)

Lymnaeidae

Lymnaea truncatula (O F Muller, 1774) – was found at loc No 4(R), 5(R), 7(R), 9(R), 10(VH), 19(H), 22(R), 25(O), 31(R), 32(R), 33(H), 36(R), 37(O), 38(H), 40(O), 48(O), 52(O), 55(H), 56(R), 57(H), 59(H), 60(R), 61(R), 63(R), 66(R), 67(R), 68(R), 72(R), 74(H), 76(H), 78(H), 79(R), 80(R), 81(R), 83(R), 84(R), 91(O), 94(R), 99(R), 100(H), 103(R), 104(R), 105(R), 110(O), 115(R), 120(R), 127(R), 129(R), 140(R), 142(H), 145(R), 146(H), 147(R), 148(H), 149(O), 152(R), 159(H), 161(R), 164(R), 165(R)

Lymnaea peregra (O F Muller, 1774) – ***Lymnaea peregra* f. *peregra*** (O F Muller, 1774) – was found at loc No 148(H), 152(H), 156(H), 163(R), 164(R), ***Lymnaea peregra* f. *ovata*** (Draparnaud, 1805) – was found at loc No 4(R), 5(H), 6(H), 7(R), 8(VH), 9(VH), 10(R), 11(R), 12(H), 13(H), 14(VH), 15(H), 18(R), 22(VH), 25(O), 26(H), 32(R), 33(R), 34(R), 37(O), 38(O), 39(R), 41(O), 43(O), 50(H), 51(R), 54(O), 56(VH), 57(VH), 59(H), 61(R), 62(H), 63(R), 65(O), 66(R) 67(R), 68(H), 71(R), 72(R), 74(R), 75(R), 76(R), 77(R), 78(R), 79(R), 80(O), 83(H), 84(R), 85(O), 86(R), 88(R), 89(R), 99(R), 100(R), 103(R), 104(R), 105(H), 107(R), 109(R), 110(H), 112(O), 113(H), 114(R), 115(R), 116(O), 117(R), 118(R), 127(R), 129(H), 133(R), 142(R), 144(R), 146(R), 149(H), 154(H), 158(H), 159(R), 161(R), 162(R), 165(R)

Lymnaea auricularia (Linnaeus, 1758) – was found at loc No 1(H), 2(H), 3(H), 6(R), 7(O), 14(H), 16(R), 18(R), 19(H), 20(R), 27(R), 28(R), 29(O), 30(R), 31(O), 32(R), 34(R-H), 38(R), 39(O), 40(O), 51(H), 53(R), 58(R), 60(O), 65(R), 71(O), 74(R), 78(R), 81(R), 84(R), 95(R), 97(R), 98(R), 107(R), 108(R), 112(O), 114(O), 118(R), 119(O), 124(O), 126(H),

127(R), 130(O), 131(R), 132(O), 135(O), 138(R), 140(R), 143(R), 145(H), 149(H), 151(H), 152(H), 153(R), 158(H), 162(O), 164(R), 165(R).

Lymnaea turricula (Held, 1836) – was found at loc. No. 3(O), 4(R), 5(R), 8(H), 9(R), 12(R), 17(H), 23(O), 24(R), 30(O), 38(O), 40(O), 44(O), 57(VH), 63(R), 66(R), 69(R), 70(R), 72(O), 76(R), 77(O), 82(O), 83(H), 92(O), 96(H), 99(R), 100(H), 101(R), 102(R), 103(R), 104(R), 107(R), 110(O), 114(H), 115(R), 116(O), 117(R), 118(O), 119(O), 129(VH), 144(H), 145(R), 149(O), 151(R), 153(VH), 154(VH), 157(VH), 164(R)

Lymnaea corvus (Gmelin, 1791) – was found at loc. No. 59. The species seems to be not rare in the Czech Republic (especially in the Bohemia), but in the studied area is very rare.

Lymnaea stagnalis (Linnaeus, 1758) – was found at loc. No. 1(R), 4(R), 6(R), 8(H), 9(VH), 10(VH), 11(VH), 12(H), 13(H), 14(H), 15(O), 18(O), 19(O), 22(VH), 24(H), 25(H), 26(R), 28(R), 29(O), 30(O), 31(R), 32(R), 33(R), 34(O), 36(R), 37(O), 39(R), 40(O), 41(O), 47(H), 50(R), 51(R), 54(O), 55(H), 57(H), 58(R), 59(H), 61(R), o3(R), 66(R), 67(R), 68(R), 69(R), 74(O), 71(R), 72(R), 73(R), 77(O), 80(VH), 81(O), 82(O), 84(R), 85(O), 86(H), 87(O), 88(R), 89(R), 95(R), 96(R), 97(O), 98(R), 99(R), 100(H), 101(H), 102(R), 103(R), 104(R), *105(R)*, *107(R)*, *108(R)*, *109(R)*, *110(H)*, *111(O)*, *112(O)*, *113(R)*, *114(H)*, *115(H)*, *116(R)*, *117(R)*, 118(H), 119(H), 120(R), 124(O), 125(R), 129(R), 131(R), 132(O), 134(H), 135(O), 136(R), 137(O), 138(R), 139(R), 142(R), 143(R), 145(R), 146(R), 149(R), 151(R), 159(O), 164(O), 165(O).

Planorbidae

Planorbis planorbis (Linnaeus, 1758) – was found at loc. No. 3(O), 5(H), 6(R), 7(H), 8(H), 11(R), 13(R), 14(VH), 15(H), 17(H), 18(H), 22(VH), 23(H), 24(R), 26(R), 31(R), 32(R), 33(VH), 37(O), 39(H), 44(H), 45(H), 46(O), 47(R), 48(O), 49(R), 50(VH), 52(VH), 54(H), 55(R), 59(R), 61(H), 62(VH), 64(R), 66(R), 69(VH), 70(VH), 71(R), 72(H), 73(O), 76(R), 77(O), 79(O), 80(H), 81(O), 82(R), 84(O), 85(O), 86(R), 88(R), 89(R), 96(R), 99(H), 100(H), 101(O), 102(R), 103(O), 104(O), 105(R), 110(O), 112(O), 114(H), 115(H), 116(O), 117(R), 119(O), 120(O), 122(R), 123(H), 125(H), 129(VH), 130(O), 134(H), 135(O), 136(H), 137(O), 138(H), 139(R), 142(O), 143(R), 145(R), 148(O), 151(H), 153(VH), 154(VH), 157(VH), 158(R), 160(VH), 165(O)

Planorbis carinatus O. F. Müller, 1774 – was found at loc. No. 66(O), 95(R), 98(H), 99(O), 101(H), 103(R), 104(H), 105(H), 107(O), 108(R), 110(R), 112(O), 118(O), 119(O), 131(R). Rare species, which may lives in the Moravia only in the studied area

Anisus spirorbis (Linnaeus, 1758) – was found at loc. No. 5(R), 8(H), 9(R), 14(H), 15(VH), 31(O), 33(VH), 52(R), 54(H), 57(R), 61(R), 69(H), 72(R), 76(O), 77(O), 79(O), 80(H), 81(R), 91(O), 92(O), 100(O), 123(R).

Anisus leucostoma (Millet, 1813) – was found at loc. No. 6(H), 7(O), 9(H), 10(H), 11(H), 35(O), 39(VH), 44(O), 59(R), 72(H), 80(VH), 81(R), 84(R), 129(H), 134(H), 153(R), 157(VH), 160(R).

Anisus vortex (Linnaeus, 1758) – was found at loc. No. 4(R), 16(R), 17(R), 20(R), 22(H), 25(O), 26(O), 27(R), 28(R), 30(O), 31(O), 32(R), 34(R), 39(H), 47(H), 48(R), 49(R), 50(O), 52(R), 56(R), 58(R), 59(R), 61(H), 63(R), 64(R), 66(R), 72(O), 79(O), 83(R), 92(O), 95(H), 98(H), 99(H), 100(H), 101(H), 102(O), 103(R), 104(R), 105(H), 107(H), 108(H), 110(H), 114(R), 115(R), 116(O), 117(R), 118(O), 119(R), 125(R), 129(R), 131(R), 141(R), 146(O), 147(O), 151(VH), 164(R), 165(O).

Anisus vorticulus (Troschel, 1834) – was found at loc. No. 25(O), 61(H), 79(O), 100(R), 103(O), 104(O), 105(H), 112(O), 114(R), 115(O), 118(O). Very rare species, which is in the Czech Republic near extinction

Bathyomphalus contortus (Linnaeus, 1758) – was found at loc. No. 72(R), 145(R), 153(R). In the Czech Republic (especially Bohemia) common mollusc, but very rare in the studied area

Gyraulus albus (O. F. Muller, 1774) – was found at loc. No. 12(H), 14(R), 19(R), 31(O), 38(O), 56(O), 57(R), 61(R), 84(VH), 98(R), 108(R), 129(O), 131(O), 138(H), 145(R), 146(R), 151(R), 159(H), 164(R).

Gyraulus laevis (Alder, 1838) – was found at loc. No. 9(VH), 10(H), 11(H), 12(R), 13(R), 14(R), 61(R), 136(R), 143(R), 144(O), 148(R), 156(R), 159(R). Relative rare species in the Czech Republic

Gyraulus crista (Linnaeus, 1758) – was found at loc. No. 10(R), 12(R), 14(O), 15(R), 28(O), 32(O), 72(O), 129(H), 136(R), 143(R), 145(R), 146(R), 153(R), 159(H)

Hippeutis complanatus (Linnaeus, 1758) – was found at loc. No. 12(R), 13(H), 28(R), 37(O), 46(O), 48(O), 63(O), 101(O), 104(R), 105(R), 107(R), 110(O), 115(O), 129(R), 131(O), 136(R), 143(R), 153(R), 159(H), 164(R)

Segmentina nitida (O. F. Muller, 1774) – was found at loc. No. 12(R), 25(R), 66(O), 69(VH), 70(H), 72(VH), 80(O), 83(R).

Planorbarius corneus (Linnaeus, 1758) – was found at loc. No. 1(O), 8(O), 14(R), 18(R), 21(R), 22(VH), 24(R), 25(H), 26(R), 28(O), 29(R), 31(R), 32(R), 33(O), 34(O), 36(O), 37(O), 39(R), 41(O), 44(O), 47(O), 48(O), 50(R), 51(R), 54(R), 55(R), 56(O), 57(O), 59(R), 60(O), 61(R), 63(O), 64(R), 66(R), 68(O), 70(H), 71(R), 72(R), 73(R), 77(R), 80(R), 82(R), 83(O), 86(R), 88(R), 89(R), 96(H), 99(R), 100(H), 101(H), 102(R), 103(R), 104(R), 105(H), 107(R), 109(R), 110(R), 111(O), 112(O), 114(R), 115(R), 116(O), 117(R), 118(H), 119(R), 120(R), 122(O), 123(R), 124(O), 125(H), 128(O), 129(H), 130(O), 132(O), 134(H), 135(R), 136(R), 138(R), 139(R), 142(R), 145(H), 146(R), 149(R), 151(H), 152(O), 153(R), 154(VH), 155(R), 157(VH), 160(R), 164(R), 165(O),

Ancylus fluviatilis O. F. Muller, 1774 – was found at loc. No. 53(O), 65(O), 147(O), 148(H)
Ferrissia wautieri (Mirolli, 1960) – was found at loc. No. 101(O), 131(R), 259(VH). Probably a North-American species

Physidae
Physa fontinalis (Linnaeus, 1758) – 31(R), 95(H), 100(R), 108(H). In the Czech Republic (especially Bohemia) common molusc, but very rare in the studied area.
Physella acuta (Draparnaud, 1805) – was found at loc. No. 1(VH), 2(R), 10(O), 13(O), 14(R), 16(R), 19(H), 20(R), 27(R), 29(VH), 31(O), 34(R), 42(R), 67(R), 97(R), 113(H), 126(VH), 127(R), 129(VH), 133(R), 136(H), 147(VH), 148(VH), 164(O)
Aplexa hypnorum (Linnaeus, 1758) – was found at loc. No. 14(R), 145(R). A relative rare species in the Czech Republic

Bivalvia
Unionoida

Unionidae
Unio pictorum (Linnaeus, 1758) – was found at loc. No. 1(R-H), 2(H), 4(xO), 16(R-H), 19(H), 20(R-H), 21(O), 27(R-H), 28(H), 30(H), 31(O), 34(R-H), 35(O), 36(R), 41(O-R), 43(R), 46(O), 48(R), 51(R-H), 53(R), 58(H), 65(O), 66(R), 67(R), 68(R), 73(O), 74(R), 76(O), 77(R), 78(R), 90(R), 91(O), 92(O), 94(R), 95(R), 98(O), 101(R), 106(R), 107(R), 108(R), 111(R), 113(O), 116(R), 119(R), 124(O), 127(O), 128(O), 129(VH), 130(O), 132(O), 133(O), 140(O), 141(O), 147(R), 149(H), 150(H), 155(R), 162(H), 165(O)
Unio tumidus Philipsson, 1788 – was found at loc. No. 1(R-H), 2(R), 4(xO), 16(R-H), 19(R), 20(R-H), 27(R-H), 28(H), 30(H), 34(R-H), 35(O), 41(O-R), 43(R), 51(R-H), 53(R), 58(R), 60(O), 65(O), 66(R), 67(R), 68(R), 73(O), 74(R), 76(R), 77(R), 78(R), 79(O), 91(H), 92(H), 93(H), 94(R), 95(R), 98(R), 101(R), 107(H), 108(R), 109(R), 111(R), 116(R), 119(R), 120(R), 124(O), 128(O), 129(VH), 130(O), 132(O), 146(R), 155(O)
Unio crassus Philipsson, 1788 – was found at loc. No. 4(xO), 43(xO), 53(xO), 65(xO), 74(O), 78(O), 91(O), 141(xO), 147(O), 148(H), 150(xO), 155(xO), 162(xR). In the Czech Republic a rare species, which was very common in the past.
Anodonta cygnea (Linnaeus, 1758) – was found at loc. No. 1(R-H), 2(R), 7(O), 13(O), 14(O), 16(R-H), 20(R-H), 21(R), 23(O), 25(R), 27(R-H), 28(H), 30(H), 31(R), 32(O), 34(R-H), 35(O), 36(O), 40(O), 41(O-R), 43(O), 48(O), 50(R), 51(R-H), 58(R), 63(R), 73(O), 74(R), 91(R), 95(H), 98(H), 101(R), 107(R), 108(H), 109(R), 110(R), 111(R), 116(R), 118(R), 119(R), 124(O), 128(O), 129(R), 130(O), 131(R), 132(O), 142(O), 147(R), 155(O), 156(R), 159(O).
Anodonta anatina (Linnaeus, 1758) – was found at loc. No. 1(R-H), 2(R), 3(O), 4(O), 14(O), 16(R-H), 19(R), 20(R-H), 21(H), 25(H), 27(R-H), 28(H), 30(H), 31(R), 34(H), 35(O), 40(O), 41(O-R), 43(R), 46(O), 48(O), 51(R-H), 52(O), 53(R), 58(R), 60(R), 63(R), 65(O), 66(R), 67(R), 71(O), 73(O), 74(O), 75(R), 76(R), 77(R), 78(R), 84(H), 87(O), 91(R), 92(R), 93(O), 94(R), 95(H), 98(H), 101(R), 105(O), 106(O), 107(R), 108(H), 109(R), 111(R), 113(R), 116(R), 119(R), 120(R), 122(O), 124(O), 127(O), 128(O), 129(VH), 130(O), 131(R), 132(O), 137(O), 140(O), 141(O), 142(R), 146(O), 147(H), 149(H), 150(R), 153(O), 155(O), 158(O), 159(O), 162(R), 165(R).
Pseudanodonta complanata (Rossmassler, 1835) – was found at loc. No. 58(O), 74(O), 76(O), 78(O). A rare species in the Czech Republic
Sinanodonta woodiana (Lea, 1834) – was found at loc. No. 58(O). First evidence of this non-native species in the Czech republic (Beran 1997).

Veneroida

Sphaeriidae
Sphaerium corneum (Linnaeus, 1758) – was found at loc. No. 3(H), 4(H), 16(R), 20(R), 26(VH), 27(R), 31(H), 34(O), 41(O), 43(R), 46(H), 48(H), 60(R), 63(R), 65(O), 74(R), 76(O), 78(R), 90(R), 91(R), 96(R), 97(H), 99(O), 100(R), 101(H), 103(O), 104(O), 105(O), 106(R), 109(R), 112(O), 113(H), 120(R), 124(O), 129(H), 140(R), 147(O), 149(O), 150(R), 151(R), 155(O).
Sphaerium rivicola (Lamarck, 1818) – was found at loc. No. 48(O), 74(xO), 90(O), 91(H), 92(O), 93(O), 97(xR), 108(xO), 113(R), 127(xR), 140(R), 141(xO), 147(R), 148(O), 149(O), 150(R), 155(O), 162(xR). A rare species, which is near extinction in the Czech Republic.
Musculium lacustre (O. F. Muller, 1774) – was found at loc. No. 26(R), 31(R), 32(R), 39(R), 48(O), 60(R), 63(R), 64(R), 72(R), 73(O), 74(O), 76(O), 86(O), 88(O), 89(O), 99(O), 100(R), 101(R), 103(O), 104(O), 105(O), 107(O), 116(O), 119(R), 127(O), 129(R), 145(R), 151(R), 155(O), 157(VH), 165(O).
Pisidium amnicum (O. F. Muller, 1774) – was found at loc. No. 148(xH), 164(xO). A rare species, which probably died out in the studied area

Pisidium henslowanum (Sheppard, 1823) – was found at loc. No 3(R), 16(R), 20(R), 27(R), 28(R), 30(R), 34(R), 35(O), 41(O), 43(R), 46(R), 48(O), 60(R), 63(R), 65(O), 66(R), 74(O), 76(H), 91(R), 92(R), 93(R), 101(R), 113(R), 140(R), 142(VH), 146(O), 147(R), 151(R)
Pisidium supinum A. Schmidt, 1851 – was found at loc. No. 48(O), 65(O), 76(H), 91(R), 93(R), 148(O). A relative rare species in the Czech Republic.
Pisidium milium Held, 1836 – was found at loc No. 76(O) A relative rare species in the Czech republic
Pisidium subtruncatum Malm, 1855 – was found at loc. No. 4(R), 31(R), 32(R), 37(O), 39(O), 44(O), 48(O), 60(R), 63(H), 76(H), 91(O), 129(O), 142(VH), 144(VH), 145(R), 146(R), 147(H), 148(VH), 154(R), 156(R), 159(H)
Pisidium nitidum Jenyns, 1832 – was found at loc No. 32(R), 48(R), 142(O), 143(H), 144(O), 145(R), 148(R).
Pisidium personatum Malm, 1855 – was found at loc. No. 129(O). A common species in the Czech Republic, but rare in the studied area
Pisidium casertanum (Poli, 1791) – was found at loc. No 16(R), 20(R), 27(R), 28(R), 30(R), 34(R), 60(R), 64(R), 66(R), 74(O), 113(R), 121(R), 127(R), 129(R), 133(O), 145(R), 147(R), 148(VH), 151(R), 152(R), 157(H), 158(O), 161(VH), 163(R), 164(R)
Pisidium moitessierianum (Paladilhe, 1866) – was found at loc. No. 46(O), 60(O), 92(R), 142(VH), 148(O). A rare species in the Czech Republic. First evidence of this species from the Moravia

Dreissenidae
Dreissena polymorpha (Pallas, 1771) – was found at loc No. 41(O), 42(VH), 51(R), 58(R), 78(O), 126(R), 159(VH), 161(H)

Zoogeographical analysis

In this chapter molluscs are divided into zoogeographical groups according to Lisický (1991).

	num.	%
Pontic	4	7.5
Mediterranean	1	1.9
European	8	15.1
Eurosiberian	7	13.2
Palearctic	18	34.0
Holarctic	13	24.5
Other *	2	3.8

* non-native (non-European) species

Conservation

In this chapter molluscs are divided into groups according to the Red List of aquatic molluscs of the Czech Republic (Beran in prep.).

Critically Endangered
Theodoxus danubialis, Viviparus acerosus, Lithoglyphus naticoides, Bithynia leachi,Anisus vorticulus, Sphaerium rivicola, Pisidium moitessierianum

Endangered
Planorbis carinatus, Unio crassus, Pseudanodonta complanata, Pisidium amnicum

Vulnerable
Anisus spirorbis, Gyraulus laevis, Segmentina nitida, Aplexa hypnorum, Unio tumidus, Anodonta cygnea, Pisidium supinum, Pisidium milium

Near Threatened
Viviparus contectus, Valvata piscinalis, Anisus leucostoma, Physa fontinalis, Musculium lacustre, Pisidium obtusale

Least Concern
Bithynia tentaculata, Valvata cristata, Acroloxus lacustris, Lymnaea truncatula, Lymnaea peregra, Lymnaea auricularia, Lymnaea turricula, Lymnaea corvus, Lymnaea stagnalis, Planorbis planorbis, Anisus vortex, Bathyomphalus contortus, Gyraulus albus, Gyraulus crista, Hippeutis complanatus, Planorbarius corneus, Ancylus fluviatilis, Unio pictorum, Anodonta anatina, Sphaerium corneum, Pisidium henslowanum, Pisidium subtruncatum, Pisidium nitidum, Pisidium personatum, Pisidium casertanum

Not Evaluated (NE)
Ferrissia wautieri, Physella acuta, Sinanodonta woodiana

A survey of the most valuable localities

In this chapter are presented localities which are the most important for survive of endangered and rare species (only species from critically endangered and endangered categories are presented).

The Dyje river – between the Nové Mlýny and inflow to the Morava river (loc. No. 2, 19, 43, 53, 58, 65, 78). Populations of *Viviparus acerosus, Lithoglyphus naticoides, Unio crassus, Pseudanodonta complanata.*
The Kyjovka river – between the Kostice village and the inflow to the Dyje river (loc. No. 67, 68, 74, 76, 94, 97, 113). Populations of *Theodoxus danubialis, Viviparus acerosus, Lithoglyphus naticoides, Unio crassus, Pseudanodonta complanata, Sphaerium rivicola*
The Velička river - between the Hroznová Lhota village and the inflow to the Morava River (loc. No. 147, 148). Populations of *Unio crassus, Sphaerium rivicola.*
The Lednický náhon canal - canal between the Bulhary village and Janův Hrad castle (loc. No. 16, 20, 27, 28, 30, 34) Populations of *Viviparus acerosus, Lithoglyphus naticoides.*
The Jízda canal (Spařavka, Čistý járek) – canal between the Morava river near Kostice and the Kyjovka river (loc. No. 66, 91, 92, 93, 95, 107, 108). Populations of *Viviparus acerosus, Lithoglyphus naticoides, Planorbis carinatus, Unio crassus, Sphaerium rivicola, Pisidium moitessierianum*).
The Morávka canal – between the Vnorovy village and the Rohatec village (loc. No 142, 146) A population of *Pisidium moitessierianum*
The Floodplain forest near Kostice – pools in the floodplain forest between Lanžhot and Tvrdonice (especially loc. No 100, 101, 103, 104, 105, 112, 114, 115, 117, 118). Populations of *Bithynia leachi, Planorbis carinatus, Anisus vorticulus*
The Lány castle – pool near the Lány castle (loc. No. 61). A population of *Anisus vorticulus.*

DISCUSSION

Altogether 46 aquatic species (32 gastropods, 14 bivalves) were found in this area by malacozoologists before 1996. Research were directed especially to gastropods. Last findings of some rare species are more than 20 years old, e. g., last evidence of *Theodoxus danubialis* is 41 years old. All these species except for *Pisidium obtusale* were also found in 1996 and 1997.

Research in 1996 and 1997 documents the findings of 53 aquatic species (33 gastropods, 20 bivalves) in the different wetlands (rivers, canals, pools, ponds) at 165 localities in the Dolnomoravský úval lowland. The diversity of aquatic malacofauna of this area is probably highest in the Czech Republic, because 75% species inhabiting the Czech Republic were found. A finding of *Sinanodonta woodiana* is the first evidence from the Czech Republic (Beran 1997) and findings of *Pisidium moitessierianum* are first for the Moravia. The most frequent species (40 localities and more) were the following common molluscs: *Viviparus contectus, Valvata piscinalis, Bithynia tentaculata, Lymnaea truncatula, L. peregra, L. auricularia, L. turricula, L. stagnalis, Planorbis planorbis, Anisus vortex, Planorbarius corneus, Unio pictorum, U. tumidus, Anodonta cygnea, A. anatina, Sphaerium corneum.* Rare occurrence of some common molluscs e. g., *Valvata cristata, Bathyomphalus contortus, Ancylus fluviatilis, Physa fontinalis, Pisidium nitidum* is surprising and was not expected. Occurrence of pontic molluscs (*Theodoxus danubialis, Viviparus acerosus, Lithoglyphus naticoides*) is typical for the lower part of area studied. These species are known in the Czech Republic only from the area under study.

Other very rare and endangered species (*Bithynia leachi, Planorbis carinatus, Anisus vorticulus, Unio crassus, Pseudanodonta complanata, Sphaerium rivicola, Pisidium moitessierianum*) were found. Some species live in the Czech Republic or in the Moravia only there. Althogether 19 species (36%) are listed in the Red List in categories Critically Endangered (7), Endangered (4) and Vulnerable (8).

Zoogeographical analysis indicates, that the most numerous groups of aquatic molluscs are species with wide distributional range – holarctic, palearctic and eurosiberian (71.7%) species. Four species of molluscs (7.5%) belong to the pontic elements.

Most valuable biotopes which are important for survive rare and endangered species are rivers, canals and pools with shallow and overgrown parts.

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BOOK REVIEW

KAUFMANN J.: **Parasitic Infections in Domestic Animals. A Diagnostic Manual.** Basel, Boston, Berlin: Birkhauser Verlag, 1996. XVI + 423 pp. Format 165×235 mm. Hardcover, price SFr 68.– ISBN 3-7643-5115-2

The author is affiliated with the Federal Department for Veterinary Health (Bundesamt für Veterinärwesen) – Section Animal Experiments and Alternative Methods in Liebefeld/Bern, Switzerland. In the late 1980s the author acted in the field laboratory of The International Trypanotolerance Centre in Gambia. There he became aware of the need for practical literature on diagnostics of parasitic diseases. The author dedicated this book to Dr. B. Horning who acted till 1992 as professor of veterinary parasitology at the Veterinary Faculty in Berne. The foreword has written G. Uilenberg. As stressed in the introduction, the present manual is intended as a tool for identification of cosmopolitan parasites affecting domestic animals around the world. In the course of compiling this work, a summary was made of the activities of some 300 institutions (national veterinary health departments, research institutes, universities, private enterprises) dealing with the research, diagnosis and control of parasitic diseases in Africa. Many laboratories, in particular those in developing countries, usually have no satisfactory access to well-furnished libraries in order to cover vast spectrum of parasites causing disease. This manual is designed for such situations. It contains, in a condensed form, all the information necessary for rapid and accurate diagnosis of parasitic infections of domestic animals. The contents is organized into 7 chapters. **Chapter 1 Methods** is intended to give an introduction to laboratory procedures for direct and indirect identifications of parasite infections in animals. Among microscopical methods listed are examinations of faecal specimens, notably detection of protozoan oocysts and sporocyst and helminth eggs and larvae. Described here are collection and examination of faeces, the direct smear test, flotation and sedimentation techniques, McMaster method for counting of eggs or larvae per gram of faeces, Baermann method, culture and identification of nematode larvae, and other coprological methods. Furthermore, described are examinations for *Trichinella spiralis* and haematological, entomological, immunological as well molecular biological laboratory procedures. **Chapters 2 through 7** are concerned with parasites of individual groups of animal hosts, namely cattle, sheep and goats, horses and donkeys, dromedaries, swine, and finally poultry. Each chapter is subdivided into 5 sections covering developmental stages (adult and immature forms) in which parasites in their hosts may occur, namely stages found in the gut and faeces, in the blood and circulatory system, in the urogenital system, in internal organs, and on the body surface. These parasite stages include protozoans, helminths – trematodes, cestodes and nematodes – and arthropods – arachnids and insects. Information relevant to each parasite species is presented in following order: scientific (Latin) name of the parasite, synonym(s), vernacular English name (if available), common name of the disease, location in host – the place of most probably finding, host species, description of parasites including their life cycles, morphology and pathological disorders caused in the host organism, furthermore geographic distribution, clinical signs of disease, economical significance, laboratory diagnosis, therapy and prophylaxis. Parasites which are not species-specific are covered in the chapter of that particular livestock species in which they play the most important role. A cross-reference is made to other animal species or organ systems in which they may also be detected. If a genus is presented as a taxonomical group, essential information is provided under the heading "general features". In the situation that diverse parasite species or genera can be controlled in a similar manner, therapy and prophylaxis may be indicated for the assemblage in question. In arthropod-borne parasitic diseases the biology of respective vector is also examined. **Parasite-like pathogens** belonging to the family Rickettsiaceae – *Ehrlichia* spp., *Anaplasma* spp., *Cowdria ruminantium*, *Eperythrozoon* spp., and other organisms detected in blood or tissue smears – are also looked at here for the sake of differential diagnosis. In conclusion, there is a **Bibliography** containing quotations of 58 textbooks, monographs and manuals. Additionally, there is another list of publications recommended for further reading. In order to allow access to relevant scientific literature, the names of diseases are presented here according to the standardized nomenclature of animal parasitic diseases (SNOAPAD) published by the expert committee, appointed by the Executive Committee of the World Association for the Advancement of Veterinary Parasitology. The highly serviceable volume is extensively augmented by 718 figures composed of mostly coloured photographs featuring parasites and their developmental stages, pathological changes in dissected organs and tissues, clinical aspects and skin lesions. Moreover, there are schematic line-drawings presenting parasites as complex unities or external and internal structural parts, transmission and life history cycles, keys for identification, and relevant laboratory procedures. In addition, there are essential data condensed into 28 summary-type tables providing information on differential morphological characters, on suggested drug regimens, and on arthropod control by acaricides and insecticides. This manual has been primarily designed for veterinary parasitologists and technicians, and for public health officials. Actually, it may be of practical value for life scientists of diverse profiles, and for medical professionals interested in parasitology and medical zoology, especially in zoonotic diseases.

Jindřich Jíra

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Larvae of the genus *Meliboeus* from Central Europe (Coleoptera: Buprestidae)

Svatopluk BÍLÝ

Department of Entomology, National Museum, Kunratice 1, CZ–148 00, Czech Republic

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Abstract. Adult larva of *Meliboeus subulatus* (Morawitz, 1861) is described and illustrated. Key to larvae of the genus *Meliboeus* Deyrolle, 1864 from Central Europe is given

Larvae, descriptions, morphology, key, Coleoptera, Buprestidae, Central Europe

INTRODUCTION

The only paper dealing with larvae of the genus *Meliboeus* was published by Alexeev (1988) who described larvae of 7 species from the territory of the former USSR. Some of these species are distributed also in Central Europe but the larva of *M. subulatus* has remained unknown so far and it is described bellow. Larvae of the genus *Meliboeus* Deyrolle, 1864 were characterized by Alexeev (1988) and Bílý (1994), and briefly discussed also by Volkovitsh & Hawkeswood (1990).

MATERIAL AND METHODS

Larvae were collected in the field to the Khale liquid and transferred to 75% alcohol in laboratory. After having studied external structures the larvae were dissected and mouth parts, antennae, spiracles and the rest of the body were mounted separately in the Swan liquid for microscopical studies.

The morphological terminology is taken from the papers of Volkovitsh (1979), Bílý (1994) and Volkovitsh & Hawkeswood (1987, 1990).

All material is deposited in the National Museum, Prague.

TAXONOMIC PART

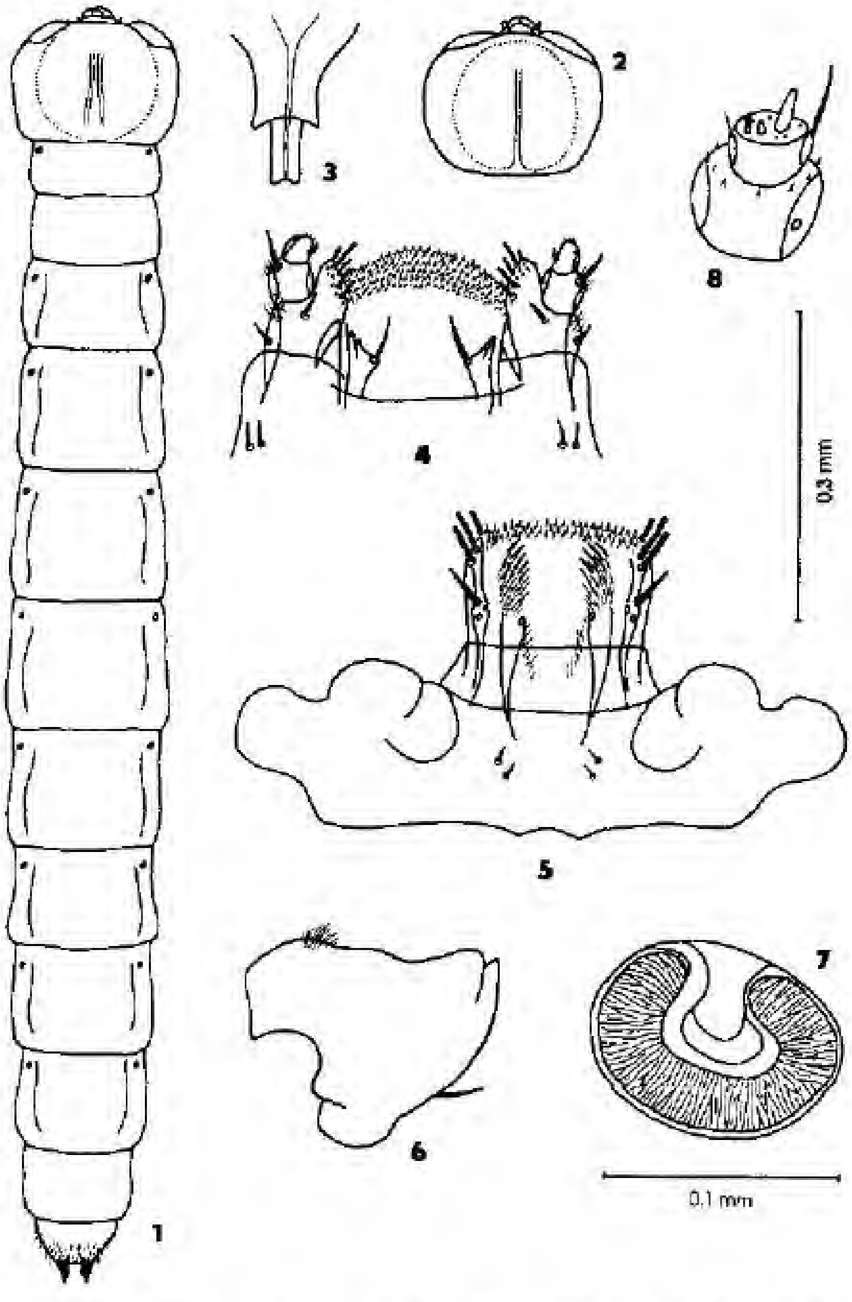
Meliboeus subulatus (Morawitz, 1861) – adult larva
(Figs 1–8, 10)

MATERIAL STUDIED. Slovakia or., Malý Kamenec, 6.iv.1980, V. Kubáň leg., 6 spec. of adult larva from roots of *Artemisia alba*

Length of the last instar: 13.5–15.0 mm; width of prothorax: 1.6–1.8 mm.

Larva is of the usual buprestoid type, whitish with well-developed urogomphi, corresponding to the third morpho-ecological type of buprestid-larvae (Bílý, 1982, 1994) (Figs 1, 2); whole body covered with extremely fine mirospinulae.

Head and mouthparts. Epistome (Fig. 5) brown, about 7 times as wide as long in the middle, its anterior margin deeply incurved between mandibular condyles which are large, nearly globular; antero-lateral projections obtuse, posterior margin narrowly incurved in the middle; latero-posterior corners obtuse-angled and rather rounded; middle part of epistome with two groups of epistomal



Figs 1–8. Larva of *Meliboeus subulatus* (Morawitz). 1 – adult larva, dorsal view, 14.5 mm; 2 – prosternal plate; 3 – urogomphi, lateral view; 4 – labiomaxillary complex; 5 – epipharynx, clypeus and labrum; 6 – right mandible; 7 – mesothoracic spiracle; 8 – right antenna.

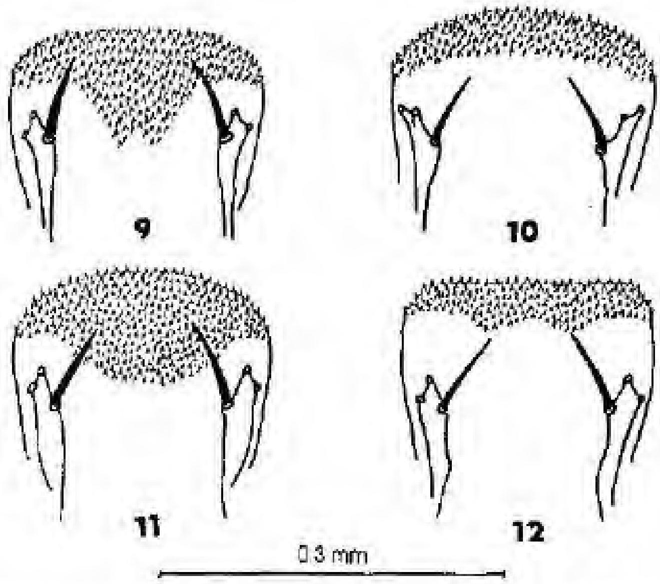
sensillae, each group consisting of 2 short, trichoid sensillae (Fig. 5). Clypeus narrow, membranous, about 3.5 times as wide as long with straight anterior margin.

Labrum (Fig. 5) about 1.6 times as wide as long, slightly transverse with straight anterior margin and rounded antero-lateral corners; palantinae sclerites with both branches well-sclerotized; each medial branch bears one campaniform sensilla, each lateral branch bears 3 trichoid sensillae apically and one trichoid and 2 campaniform sensillae near its middlength; ventral surface of labrum (epipharynx) bears 2 small, longitudinal fields of slightly curved setae.

Antennae (Fig. 8) short, two-segmented, situated in latero-posterior incisure of epistome; first segment broadly cylindrical, slightly wider than long only with a few microspinules on its apical margin; second segment wide, ring-shaped, about twice as wide as long with one long and one shorter apical setae; apical part of the second segment not invaginate, bearing well-developed sensory appendage, palmate sensilla and basiconical sensilla.

Mandibles (Fig. 6) strongly sclerotized, dark brown with arched outer margin and 2 apical teeth; inner margin of mandibles with small but well-developed prosteca.

Labiomaxillary complex (Fig. 4). Maxillae: cardo membranous with 2 short, trichoid sensillae arising from membrane at the base of cardo; stipes with well-sclerotized both inner and outer sclerite bearing one trichoid sensilla at the middlength of outer sclerite and one trichoid sensilla arising from membrane at the apex; mala thumb-shaped bearing 5 thick apical setae and several microspinulae near apex and on its inner margin; maxillary palpus two-segmented, first segment being slightly longer than wide bearing one long apical seta and several latero-apical microsetae; second segment of maxillary palpus slightly conical with well-developed sclerites, bearing one outer, campaniform sensilla and one inner curved sensilla; apex of the second segment with several microspinulae and small, peg-like sensillae.



Figs 9–12. Labium of *Meliboeus* Deyrolle. 9 – *M. amethystinus* (Olivier), 10 – *M. subulatus* (Morawitz), 11 – *M. graminis* (Panzer), 12 – *M. graminoides* Abeille.

Labium (Fig. 4) only slightly longer than wide, its anterior margin convex with a field of microspinulae; lateral margins of labium feebly incurved; corner sclerites of labium short and wide, poorly sclerotized bearing one trichoid and 2 campaniform sensillae apically.

THORAX. Pronotal plate (Fig. 1) slightly sclerotized, covered with dense microspinulae and bearing 2 sclerotized grooves which are subparallel in their anterior half and slightly diverging in their posterior half. Prosternal plate (Fig. 2) slightly sclerotized, also covered with dense microspinulae bearing one sclerotized, medial groove which does not reach anterior margin of prosternal plate. Rest of thorax covered with not very dense microspinulae and isolated, short hairs.

Spiracles (Fig. 7) semicircular, both mesothoracic and abdominal spiracles of the same type, abdominal ones smaller; peritreme well-sclerotized, trabeculae dense, nearly parallel, not very branched.

Abdominal segments (Fig. 1) shortly cylindrical, slightly wider than long with dorso-lateral, longitudinal folds, covered with rather sparse, extremely fine microspinulae. Anal segment with well-developed and sclerotized, two-teethed urogomphi (Figs 1, 3); nearly entire anal segment covered with rather long but sparse hairs.

Key to *Meliboeus* larvae from Central Europe

1 (4) Pronotal grooves parallel or nearly parallel

2 (3) Anterior margin of labium straight, field of microspinules on outer surface of labium triangular (Fig. 9), host plants: *Carduus, Cirsium, Carlina, Onopordon* .... *M. amethystinus* (Olivier, 1790)

3 (2) Anterior margin of labium convex, field of microspinules on outer surface of labium not triangular (Figs 4, 10); host plant *Artemisia* .... *M. subulatus* (Morawitz, 1861)

4 (1) Pronotal grooves distinctly inverted V-shaped.

5 (6) Anterior margin of labium convex, field of microspinules on outer surface of labium triangular (Fig. 11); pronotal grooves completely surrounded by feebly sclerotized pronotal plate; host plants *Helichrysum, Centaurea, Artemisia* .... *M. graminis* (Panzer, 1789)

6 (5) Anterior margin of labium straight; field of microspinules on outer surface of labium not triangular (Fig. 12); only anterior half of pronotal grooves surrounded by feebly sclerotized field, host plant, *Tanacetum* .... *M. graminoides* Abeille, 1896

Acknowledgements

I would like to thank to my colleague V. Kubáň (Moravian Museum, Brno) who collected larvae of *M. subulatus* and provided me with this material for the present description. The present paper is a part of the Grant No. 513/96/0004 of the Czech Grant Agency.

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Revision of the genus *Glipostena* (Coleoptera: Mordellidae)

Jan HORÁK

K hádku 567, Dubeček, CZ-107 00 Praha 10 – Dubeč, Czech Republic

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Abstract. The genus *Glipostena* Ermisch, 1941 is revised and all known species are redescribed (and description of all known species are complemented with new observations). *Mordellistena glipodoides* Blair, 1931 is transferred to *Glipostena*. *Mordellistena palembanga* Pic, 1941 and *M. maxima* Pic, 1941 are junior synonyms of *Glipostena glipodoides*.

Taxonomy, Coleoptera, Mordellidae, *Glipostena*, *Mordellistena*, Oriental region, Afrotropical region, New Guinea

INTRODUCTION

The genus *Glipostena* Ermisch, 1941 occurs in the Palaeotropics and in New Guinea. It is presumably an archaic genus, known also from the Baltic amber (Miocene) (Ermisch 1943). The Tertiary species *Glipostena sergeli* Ermisch, 1943 is habitually quide identical with modern species (with its modern congeners) except for different arrangement of the ridges on posterior legs; which are very short and parallel; in this respect, the most similar among the recent species *Glipostena nemoralis* Franciscolo, 1962 from the West Africa. In remaining three hitherto known species of the genus the lateral ridges on hind tibia are long and oblique. Judging from the scarce material available, species of the genus are distributed over extensive parts of the Palaeotropics and also in the New Guinea. The genus has been known only in females and just the ignorance of males lead Franciscolo (1962) to some speculations on the relationship of *Glipostena* to the American genus *Glipodes* Leconte, 1868. The revision of the material of *Glipostena* in the Paris, London and Prague museums revealed three males belonging to two species of the genus. They confirm the fact that *Glipostena*, as defined by Ermisch (1941), is a distinct and well delimited genus.

Very large eyes of *Glipostena* suggest the nocturnal habits of the genus, known to occur (quite or partly) also in the species of *Macrotomoxia* Pic, 1922 and *Glipostenoda* Ermisch, 1950.

However, not all problems of the systematics of *Glipostena* can be resolved in the present paper because of the very limited material available. A future reevaluation based on a more extensive material will therefore be necessary.

ACRONYMS

MNHN Muséum national d'Histoire naturelle, Paris
NHML Natural History Museum, London
NMP Národní Muzeum, Praha
SMTD Staatliches Museum für Tierkunde, Dresden

SYSTEMATICS

Gliposlena nemoralis Franciscolo, 1962

Gliposlena nemoralis Franciscolo, 1962: 119–120.

DISTRIBUTION. Angola, Gabon.

MATERIAL EXAMINED. 1 female (NMP), Africa occidentalis, Gabon franc., Lac Zonanghé, Ing. Lamarie leg.

COMMENTS. Habitually quite identical with remaining species of the genus, but with different arrangements of the ridges on hind tibia. It has four lateral ridges parallel to the short apical ridge and not reaching the middle of the metatibia width. This feature resembles the Miocene species *G. sergeli* in which, however, the number of ridges on both metatibia and hind tarsus is different. The arrangement and number of the ridges on tarsal segments in *G. nemoralis* corresponds to those in all known recent species of the genus.

NOTE. Corresponding specimens are known also from Madagascar. One pair is deposited in MNHN and one female in my collection. Females are quite identical with that from Gabon, but since the male of the true *G. nemoralis* unknown, the systematic position of the Malagassy specimens cannot be resolved with certainty.

Gliposlena glipodoides (Blair, 1931) comb. n.
(Figs 1–5)

Mordellistena glipodoides Blair, 1931: 204.
Mordellistena palembanga Pic, 1941: 9; **syn. n.**
Mordellistena maxima Pic, 1941: 9; **syn. n.**

DISTRIBUTION. India, Sumatra, Borneo, New Guinea.

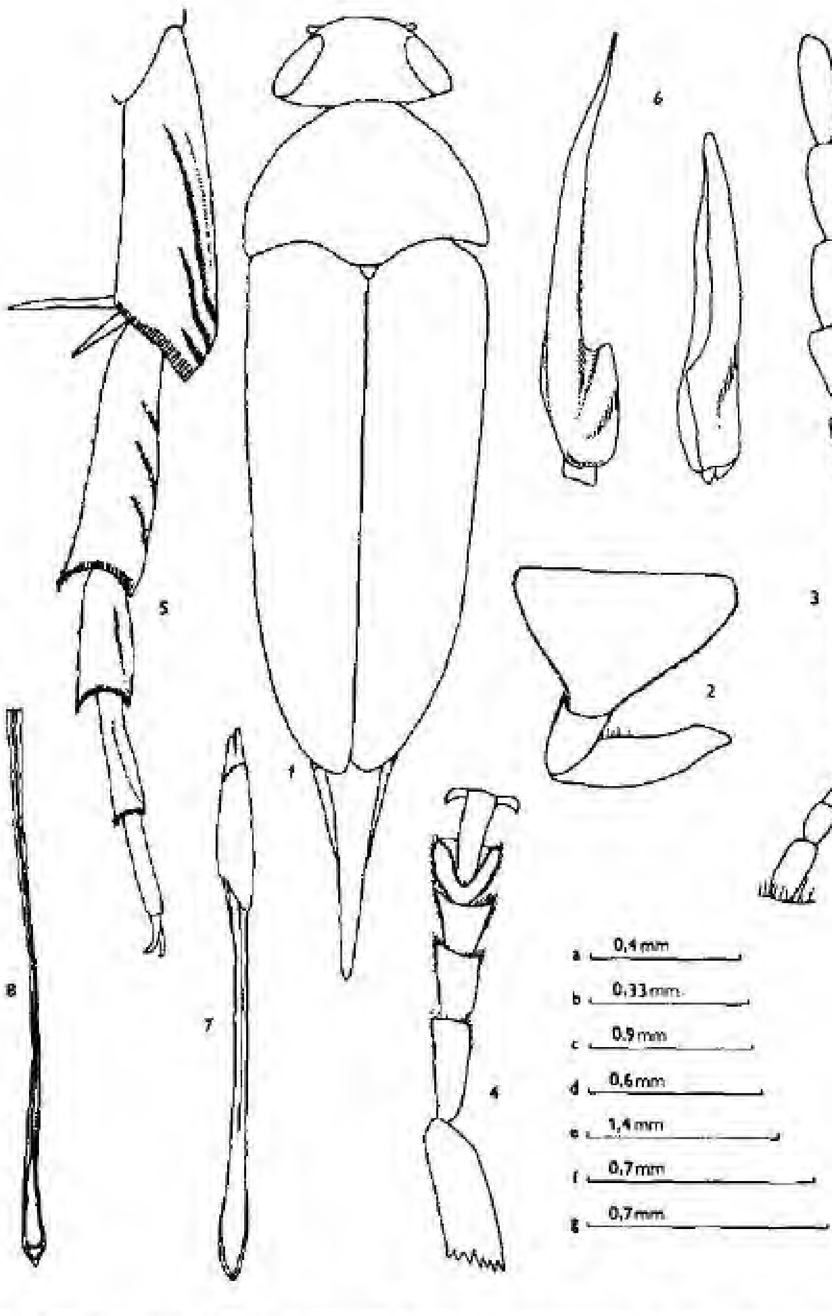
MATERIAL EXAMINED. Holotype (by present designation), female (NHML), India, Bombay, S. Kanara, Agsur, 20.8.1930, B. M. Bhatia leg., R.R.D.49, B.C.R.203, Cage 108, ex *Mangifera indica*; 1 female (MNHN), Sumatra, Palembang, „Holotype (by present designation) of the species *Mordellistena palembanga*"; 1 female (MNHN), Borneo Holl., Pontiak, 1 female (MNHN), Borneo, Doesanlanden (Wahnes), „Lectotype (by present designation) of the species *Mordellistena maxima*"; 1 female (MNHN), the same data, „Paralectotype (by present designation) of the species *Mordellistena maxima*"; 1 female (MNHN), N. Guinea, Biró, 96, labelled as „*Mordellistena maxima* var.".

COMMENTS. Three species described according to the female type specimens from India (Blair 1931), Sumatra, Borneo and New Guinea (Pic 1941) respectively, are quide identical. They all have two strongly oblique lateral ridges on hind tibiae (Fig. 5), the upper one being nearly twice as long as the lower; above the upper lateral ridge there is another ridge which does not copy exactly the dorsal surface of the hind tibia. This additional ridge is developed in the holotype of *G. glipodoides* and in the New Guinea specimen, and missing in the other studied specimens.

Anyway, the type specimens of both *Mordellistena palembanga* and *M. maxima* are quite identical with that of *G. glipodoides* and the two names must be considered as junior synonyms of the latter species. The original description by Blair (1931) is complemented by illustrations of the body form, maxillary palpus, antenna, anterior tarsus and hind leg (Figs 1–5).

Gliposlena pelecotomoidea (Pic, 1911)
(Figs 6–8)

Mordellistena pelecotomoidea Pic, 1911: 189.
Gliposlena pelecotomoidea, Ermisch, 1941: 723.
Gliposlena pelecotomoides, Ermisch, 1949: 80–81.



Figs 1–8. *Glipostena glipodoides* (Blair) (holotype, female). 1 – general view, 2 – maxillary palpus; 3 – antenna, 4 – anterior tarsus; 5 – posterior tibia and tarsus. *G. pelecotomoidea* (Pic) (Singapore, male) 6 – paramere, 7 – phallobasis; 8 – penis. Scale: a – 2, b – 4; c – 5; d – 7, 8; e – 1; f – 6; g – 3

DISTRIBUTION. Taiwan, Vietnam, Singapore, Sri Lanka.

MATERIAL EXAMINED. Holotype (by present designation), female (MNHN), Formosa, Taibovimbe, 11 1909, Sauter, labelled as „Type"; 1 female (MNHN), Lao Kay, 2 females (MNHN), Hoa Binh, 2 females (NHML) (Paralectotypes, by present designation, of the species *G. glipodoides*), Ceylon, Nietner, Fry coll., 1905 – 100, 1 male and 1 female (NHML) (Paralectotypes, by present designation, of the species *G. glipodoides*), Singapore, C. F. Baker coll., 1919 – 207

COMMENTS. This species is widely distributed throughout the eastern part of the Oriental region excluding of Indonesia and the Philippines. It is characterized especially by the pattern of lateral ridges on metatibia. Apart from the apical ridge, three very oblique lateral ridges of unequal length are developed, the uppermost one being the longest. Above the latter ridge is sometimes developed another ridge, by its position and structure resembling a rudiment of the dorsal ridge. Configuration of the ridges an metatibia in *G. pelecotomoidea* corresponds to that *G. congoana* (central Africa), but the two species differ by the form of antennal segments and male genitalia (Figs 6–8).

Glipostena congoana Ermisch, 1952
(Figs 9–16)

Glipostena congoana Ermisch, 1952: 84

DISTRIBUTION. Zaire, Cameroons, Gabon, Sierra Leone, the Comore Is.

MATERIAL EXAMINED. 1 male (SMTD), Musée du Congo Equateur Flandria, 9 1929, R. P. Hulstaert, labelled as „Glipostena congoana Erm., Det. Ermisch, 1955", 1 female (MNHN), Musée du Congo, Kasai (riv. re), 12 1927, Lt. J. Ghesquire, labelled as „Mordellistena pelecotomoidea Pic, var.", 1 female (MNHN), Sierra Leone, Njala, 10 5 26, E. Hargreaves, labelled as „Mordellistena pelecotomoidea Pic, var."; 2 females (MNHN), Gabon, Bojone, Gavuselt, 1 male (MNHN), W. Africa, Gabon, Mocquerys; 1 female (MNHN), Sanzulu, 4 4 26, A. Colart, labelled as „Mordellistena sp."

COMMENTS. According to Ermisch (1952) and Franciscolo (1962) this species ought to have middle tibia shorter than middle tarsi and thus to differs from all other species of the genus. The revision of the material from the Ermisch collection (SMTD) as well as of the further material from the Pic collection (MNHN) revealed that the proportions of middle legs do not differ from those of other species, i.e. that middle tarsi are distinctly shorter than middle tibiae (Fig. 12). The opposite information in the original description by Ermisch (1952) is probably due to the unwilling mistake of the author. The description is complemented here with illustrations of the habitus, antenna, fore tarsus, middle and hind legs and male genitalia (Figs 9–16).

Key to the known species of *Glipostena*

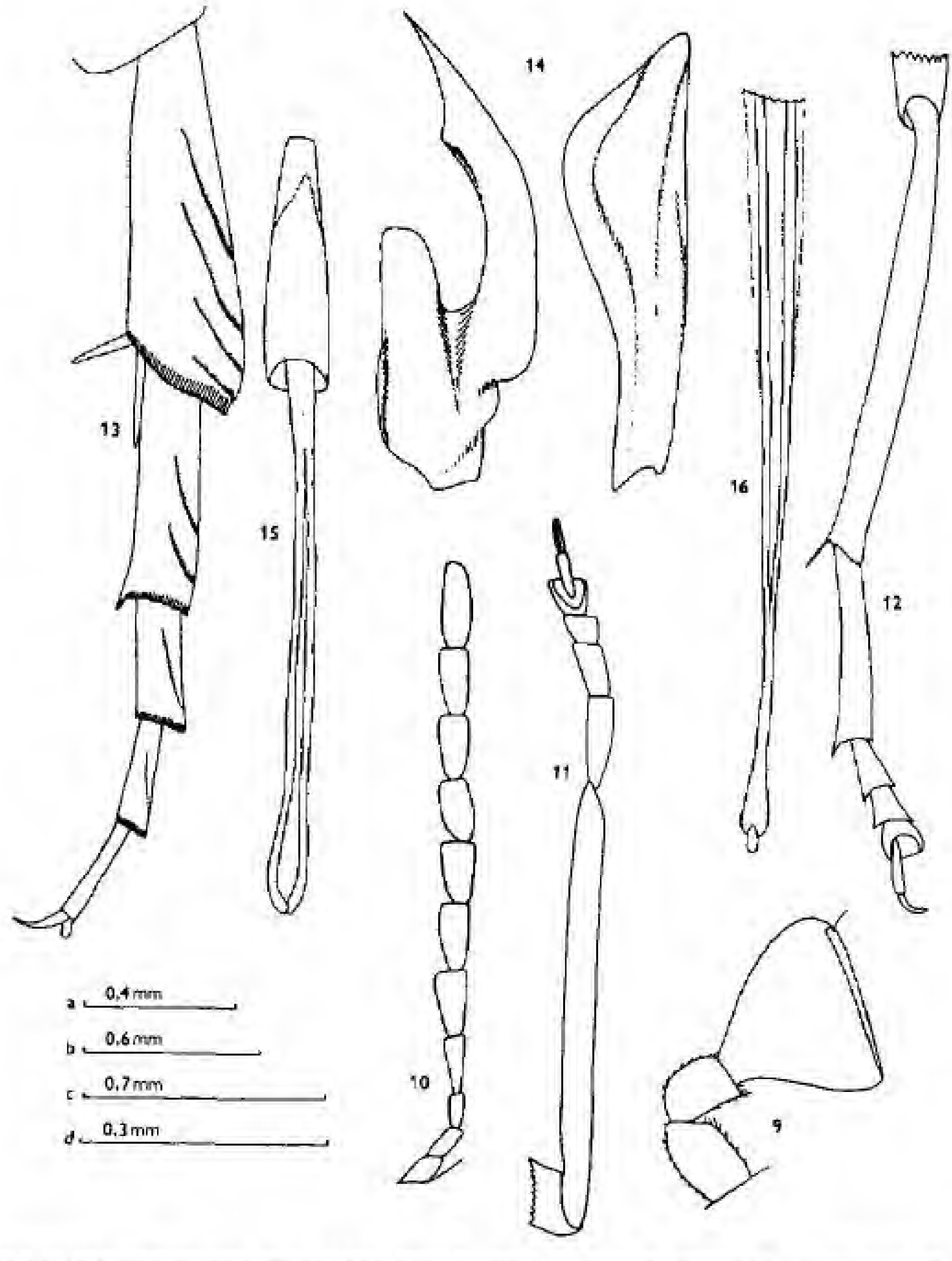
1(2) Fossil species. Posterior tibia with 7 very short and little oblique lateral ridges. The first segment of hind tarsus with 5, second with 3 and the third with 2 ridges. Baltic amber, Miocene. .... †*G. sergeii* Ermisch

2(1) Recent species. Posterior tibia with 2–4 very oblique lateral ridges, which are as a rule very long, or with 4 parallel to apical ridge and short lateral ridges. The first segment of hind tarsus with 3 ridges, the uppermost ridge sometimes rudimentary, seldom quite absent, the second and third segments with 1 ridge each

3(4) Hind tibia with 4 lateral ridges (the uppermost one seldom rudimentary), which are parallel to apical ridge and all equally long, not reaching the middle of the tibia width. Gabon, Angola .... *G. nemoralis* Franciscolo

4(3) Hind tibia with 2–3 very oblique lateral ridges of inaqual length, the uppermost ridge by one third to one half longer than the lowermost one. Often appears above the uppermost lateral ridge an additional ridge, resembling by its structure a rudiment of dorsal ridge (Fig. 5)

5(6) Posterior tibia with two lateral ridges of inequal length, upper ridge twice as long as the lower one, seldom the third "dorsal" ridge occurs (Fig. 5). India, Sumatra, Borneo, New Guinea............... *G. glipodoides* (Blair)



Figs 9–16 *Gliposlena congoana* Ermisch (Congo, male). 9 – maxillary palpus; 10 – antenna; 11 – anterior tarsus, 12 – mesotibia and middle tarsus; 13 – posterior tibia and tarsus; 14 – paramere; 15 – phallobasis; 16 – penis. Scale. a – 9; b – 15, 16, c – 10, 11, 12, 13; d – 14.

6(5) Posterior tibia with three lateral ridges of inequal length (Fig 13), the uppermost ridge by one third to one half longer than the lowermost one Frequently with the fouth "dorsal" ridge

7(8) The fourth segment of male antenna by more than one third longer than the third one and almost three times as long as wide, following segments in male almost three times, in female 2 5 times longer than wide Japan, Taiwan, Vietnam, Singapore, Sri Lanka *G pelecotomoidea* (Pic)

8(7) The fourth segment of male antenna only by one fourth longer than the third one and only a little more than twice as long as wide, following segments in both sexes nearly 2 2 times longer than wide Zaire, Gabon, Cameroon, Sierra Leone, Comore Is *G congoana* Ermisch

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I am obliged for the loan of material to the following entomologists and institutions Jane Beard (The Natural History Museum, London), Claude Girard (National Museum of Natural History, Paris), R Krause (Staatliches Museum für Tierkunde, Dresden) and Josef Jelinek (National Museum, Prague)

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Isometrus (*Reddyanus*) *krasenskyi* sp. n. from Indonesia and *I.* (*R.*) *navaiae* sp. n. from the Philippines (Scorpiones: Buthidae)

František KOVAŘÍK

P. O. Box 27, CZ-145 01 Praha 45, Czech Republic

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Abstract. *Isometrus* (*Reddyanus*) *krasenskyi* sp. n. and *I.* (*R.*) *navaiae* sp. n. are described and compared to all other species of the subgenus *Reddyanus* Vachon, 1972, from which they differ in a combination of characters including five granules on the subaculear tooth. *I.* (*R.*) *krasenskyi* sp. n. is uniformly yellow with dark fourth and fifth segments and telson of the metasoma. *I.* (*R.*) *navaiae* sp. n. is characterized by total length of 19–34.4 mm, 12–14 pectinal teeth, absence of a dark triangle between the median eyes and anterior margin of the carapace, and coloration of the mesosomal segments with two dark bands.

Taxonomy, description, new species, Scorpiones, Buthidae, *Isometrus*, *Reddyanus*, Oriental region

Isometrus (*Reddyanus*) *krasenskyi* sp. n.
(Figs 1–3, Tab. 1)

TYPE MATERIAL. Holotype female preserved in 75% alcohol, labeled: Java, 1980. It is currently in the author's collection, but will be deposited in the Department of Zoology, National Museum (Natural History), Prague.

ETYMOLOGY. Named in honor of Pavel Krásenský of Chomutov, Czech Republic, who has illustrated the habitus of most of the new species of scorpions described by me.

DESCRIPTION. The total length is 32.8 mm. The habitus is shown in Fig. 1. Measurements of the carapace, telson, segments of the metasoma and of the pedipalps, and numbers of pectinal teeth are given in Table 1. There are 10 and 12 pectinal teeth. For the position and distribution of trichobothria on the tibia of pedipalps see Fig. 2.

The color is uniformly yellow except for the fourth and fifth segments and telson of the metasoma which are dark brown. The fingers of pedipalps are pale brown but darker than manus. Only the immediate vicinity of median and lateral eyes is black. The patella of pedipalps has a large but inconspicuous pale brownish-yellow blotch covering much of the dorsal surface.

The chelicerae are weakly reticulated in the anterior part. Movable fingers of the chelicerae bear a large yellowish-brown spot.

The carapace is without keels but bears large granules evenly distributed over the entire surface.

The femur of pedipalps has five well developed keels. The dorsal surface bears sparse but pronounced granules. The patella has three dorsal keels and only one lateral keel. The movable fingers bear six cutting edges and the fixed fingers bear seven such edges. The sixth cutting edge on the movable fingers has one external granule and no internal granules (Fig. 4). The seventh cutting edge on the fixed fingers lacks external and internal granules.

The dorsal surface of the mesosoma bears a median keel, and its seventh segment bears four keels on the ventral surface.

The legs are yellow and lack tibial spurs.

The first metasomal segment bears 10 keels, the second through fourth segments bear eight keels All keels are well developed and consist of fine granules of the same size There are two ventral keels on the first through fourth segments and one ventral keel on the fifth segment The subaculear tooth bears five granules in three rows (Fig 3)

AFFINITIES *I* (*R*) *krasenskyi* sp n differs from all other species of the subgenus *Reddyanus* in the following diagnostic characters.

It differs from *I* (*R*) *assamensis* Oates, 1888, *I* (*R*) *corbeti* Tikader & Bastawade, 1983, *I* (*R*) *heimi* Vachon, 1976, *I* (*R*) *kurkai* Kovařík, 1997, *I* (*R*) *rigidulus* Pocock, 1897, and *I* (*R*) *basilicus* Karsch, 1879 in having five granules on the subaculear tooth (Fig 3 and figs 5–10 in Kovařík 1997 6)

The new species can be distinguished from species belonging to the same group acording to the numbers of granules on subaculear tooth (Kovařík 1997 7) in having different coloration and different number of pectinal teeth

The uniformly (not spotted) yellow color of the legs differentiates *I* (*R*) *krasenskyi* sp n from *I* (*R*) *acanthurus* Pocock, 1899 (Pocock 1900 51 and author's collection), *I* (*R*) *besucheti* Vachon, 1982 (author's collection), *I* (*R*) *brachycentrus* Pocock, 1899 (Pocock 1900

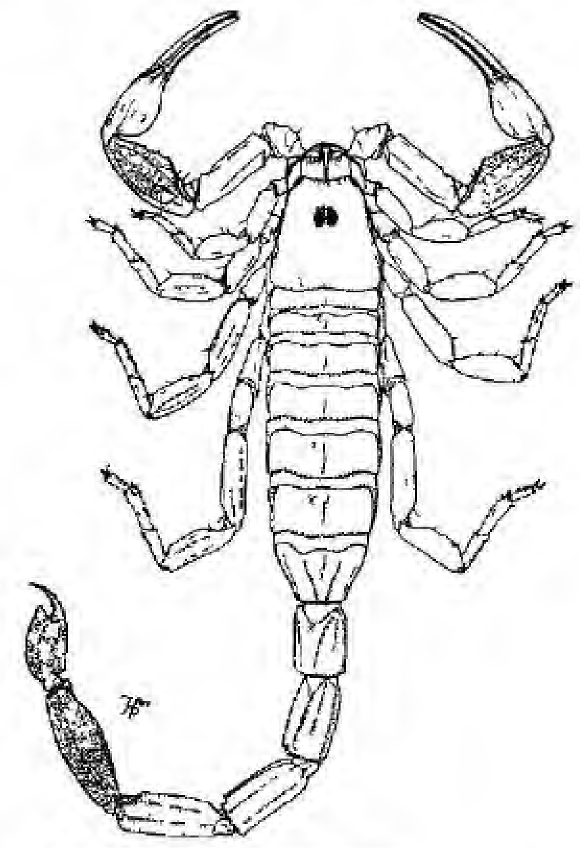


Fig 1 *Isometrus* (*Reddyanus*) *krasenskyi* sp n (holotype) Dorsal aspect

50), *I.* (*R.*) *melanodactylus* (L. Koch, 1867) (author's collection), *I.* (*R.*) *navaiae* sp. n., *I.* (*R.*) *vittatus* Pocock, 1900 (author's collection), and *I.* (*R.*) *zideki* Kovařík, 1994 (Kovařík 1994: 195 and author's collection).

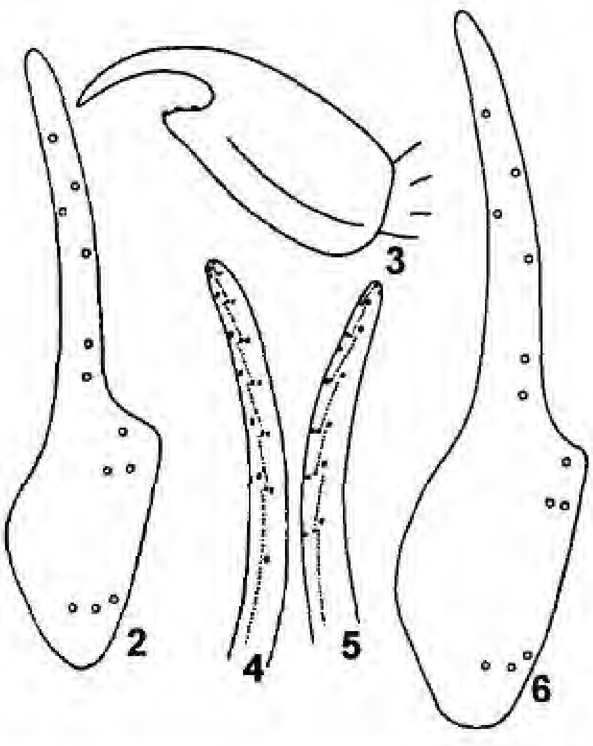
I. (*R.*) *krasenskyi* sp. n. has 10–12 pectinal teeth, whereas *I.* (*R.*) *acanthurus* Pocock, 1899 has 16–17 (see Pocock 1900: 51, Vachon 1982: 98, and author's collection) and *I.* (*R.*) *besucheti* Vachon, 1982 has 13–18 (see Vachon 1982: 95 and author's collection).

Isometrus (*Reddyanus*) *navaiae* sp. n.

(Figs 4–7, Tab. 1)

TYPE MATERIAL. Philippines: S. Mindanao, Port Banga, V.1915, 4F (holotype and paratypes Nos 1–3); N. Mindanao, Kolambugan, I.1905, 1F1juv. (paratypes Nos 4–5); Luzon, Banakao, 2000 m, 25.IV.1914, 1F (Paratype No. 6). All specimens were collected by S. Böttcher & V. Heyne and accessioned as 137D/24. They are preserved in 75% alcohol. The holotype and paratypes Nos 1 and 4–6 are deposited in the Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany, paratype No. 3 in the Department of Invertebrate Zoology, National Museum (Natural History), Prague, and paratype No. 2 is currently in the author's collection, but will be deposited in the Department of Invertebrate Zoology, National Museum (Natural History), Prague.

ETYMOLOGY. Named in honor of Mrs. Shahin Navai of the Museum für Naturkunde, Zentralinstitut der Humboldt-Universität zu Berlin, Germany, in appreciation of her kind help.



Figs 2–6. Figs 2–3 – *Isometrus* (*Reddyanus*) *krasenskyi* sp. n. (holotype): Fig. 2 – tibia, Fig. 3 – telson. Figs 4–6 – *I.* (*R.*) *navaiae* sp. n. (holotype). Fig. 4 – movable finger of pedipalp, Fig. 5 – fixed finger of pedipalp, Fig. 6 – tibia.

Table 1. Measurements in millimeters of the holotype of *Isometrus (Reddyanus) krasenskyi* sp. n. and *I. (R.) navaiae* sp. n. Line denoted „pectinal teeth" contains numbers of both left and right teeth separated by a colon

		Isometrus krasenskyi sp. n. holotype	*Isometrus navaiae* sp. n. holotype
Total	length	32.8	34.4
Carapace	length	3.5	4.0
	width	3.4	3.9
Metasoma	length	18.0	20.9
segment I	length	2.1	2.4
	width	1.5	1.6
segment II	length	2.6	3.1
	width	1.3	1.4
segment III	length	2.9	3.4
	width	1.3	1.3
segment IV	length	3.3	3.9
	width	1.3	1.3
segment V	length	3.7	4.6
	width	1.3	1.3
telson	length	3.0	3.7
Pedipalp			
femur	length	2.8	3.5
	width	0.9	1.2
patella	length	3.4	4.0
	width	1.3	1.6
tibia	length	5.3	6.2
manus	width	1.2	1.4
movable finger	length	3.1	4.1
Pectinal teeth		10:12	13:13

DESCRIPTION. The total length is 19–34.4 mm. The habitus is shown in Fig. 7. Measurements of the carapace, telson, segments of the metasoma and of the pedipalps, and numbers of pectinal teeth are given in Table 1. There are 12–14 pectinal teeth (2×12, 8×13, 3×14). For the position and distribution of trichobothria on the tibia of pedipalps see Fig. 6.

The base color is yellow to reddish brown, with black reticulation. The mesosoma bears two dark bands on dorsal margins. A median band is indicated by dark spots at posterior margins of the segments. The posterior margins of the mesosomal segments and of the carapace bear eight yellow spots or a yellow longitudinal band interrupted by dark transverse bands and spots. The metasoma is dominantly reddish brown. Dark spots are present chiefly on the ventral surface of the metasomal segments and telson.

The chelicerae are weakly reticulated anteriorly, and their movable fingers bear a large dark spot.

The carapace lacks keels but bears large granules.

The femur of the pedipalps has five well developed keels. The dorsal surface is densely and evenly granulated. The patella has three dorsal keels and only one lateral keel. The movable fingers bear six cutting edges (Fig. 4) and the fixed fingers bear seven such edges (Fig. 5). The sixth cutting edge on the movable fingers has one external granule and no internal granules (Fig. 4). The seventh cutting edge on the fixed fingers lacks external and internal granules (Fig. 5).

The dorsal surface of the mesosoma bears a median keel, and the ventral surface of its seventh segment bears two cinspicuous blacks keels with two additional keels between them indicated by granules.

The legs lack tibial spurs.

The first metasomal segment bears 10 keels, the second through fourth segments bear eight keels. All keels are well developed and consist of fine granules of egual size, except for dorsal keels on the second and third segments which terminate in a markedly larger tooth. There are two ventral keels on the first through fourth segments and one ventral keel on the fifth segment and telson. The subaculear tooth bears four to five granules in two or three rows (Fig. 3 and fig. 8 in Kovařík 1997: 6).

AFFINITIES. *I. (R.) navaiae* sp. n. differs from all other species of the subgenus *Reddyanus* in the following diagnostic characters.

I. (R.) navaiae sp. n. differs from *I. (R.) assamensis* Oates, 1888, *I. (R.) corbeti* Tikader & Bastawade, 1983, *I. (R.) heimi* Vachon, 1976, *I. (R.) kurkai* Kovařík, 1997, *I. (R.) rigidulus* Pocock, 1897, and *I. (R.) basilicus* Karsch, 1879 in having four to five granules on the subaculear tooth (Fig. 3 and figs 5–10 in Kovařík 1997: 6).

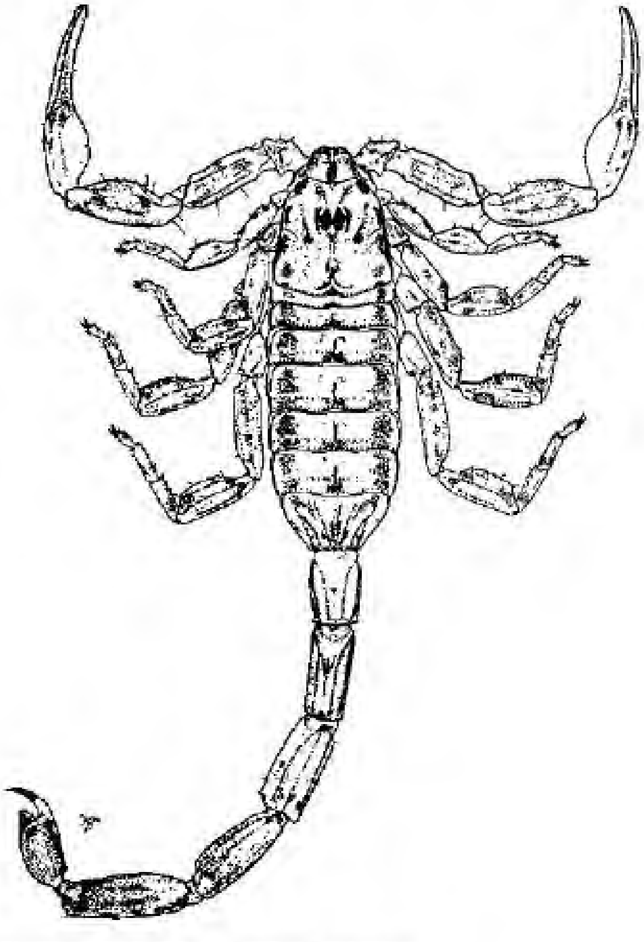


Fig. 7. *Isometrus (Reddyanus) navaiae* sp. n. (holotype). Dorsal aspect.

The new species can be distinguished from species belonging to the same group acording to the numbers of granules on subaculear tooth (Kovařík 1997: 7) in having different coloration and different number of pectinal teeth.

I. (*R.*) *navaiae* sp. n. is much larger (Tab. 1) than *I.* (*R.*) *besucheti* Vachon, 1982 from Sri Lanka and *I.* (*R.*) *zideki* Kovařík, 1994 from Malaysia and Indonesia, and has a lower number of pectinal teeth as *I.* (*R.*) *acanthurus* Pocock, 1899 from Sri Lanka and India. *I.* (*R.*) *acanthurus* has 16–17 pectinal teeth (see Pocock 1900: 51), and *I.* (*R.*) *navaiae* sp. n. has 12–14 pectinal teeth.

I. (*R.*) *navaiae* sp. n. can be easily distinguished from *I.* (*R.*) *vittatus* Pocock, 1900 of India and Vietnam in coloration, as it lacks a dark triangle between the median eyes and the anterior margin of the carapace. This triangle is well apparent in *I.* (*R.*) *vittatus* and also in *I.* (*R.*) *brachycentrus* Pocock, 1899 (see Pocock 1899: 263) from India. Furthermore, the median dark band on the dorsal surface of the mesosoma is solid in *I.* (*R.*) *vittatus* whereas in *I.* (*R.*) *navaiae* sp. n. it is merely a series of dark spots (Fig. 7).

Two dark bands on the dorsal surface of the mesosoma distinguish *I.* (*R.*) *navaiae* sp. n. from *I.* (*R.*) *melanodactylus* (L. Koch, 1867) of New Guinea, which has dark spots but lacks clear and continuous bands. Also, females of *I.* (*R.*) *melanodactylus* do not reach the size of *I.* (*R.*) *navaiae* sp. n.

DISCUSSION

Examination of a fair number of specimens convinces me that a division of species of the subgenus *Reddyanus* based on the number of granules on the subaculear tooth is warranted (Vachon 1976: 43, Kovařík 1997: 7). However, the terminal granules on the pointed or rounded tip of the subaculear tooth are often variable and sometimes so minute and inconspicuous that their inclusion or exclusion is not unequivocal and thus likely to be handled differently by different authors. It is therefore desirable to divide the species into groups with (1) two granules (without any on the tip) to four granules (with two on the tip) as in figs 5–7 of Kovařík 1997: 6, (2) four to six granules as in figs 8–9 of Kovařík 1997: 6, and (3) the species *I.* (*R.*) *basilicus* with seven granules as in fig. 10 of Kovařík 1997: 6. This divides the species into three groups rather than into four as recently suggested by myself (Kovařík 1997: 7). However, even the three-tie division does not quite dispose of variability, necessitating inclusion of *I.* (*R.*) *zideki* and *I.* (*R.*) *melanodactylus* in groups 1 and 2. Examination of this character in a larger number of specimens would be helpful.

Acknowledgements

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Amphimallon sithoniense sp. n. from Greece (Coleoptera: Scarabaeidae)

David KRÁL

Department of Zoology, Charles University, Viničná 7, CZ–128 44 Praha 2, Czech Republic

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Abstract. *Amphimallon sithoniense* sp. n. discovered in the Sithonia peninsula (Chalkidiki, Greece) is described. The new species is assigned to the *A. solstitiale* (Linnaeus, 1758) species group and differs from all other known representatives of the group mainly by the antennal club being considerably longer than antennal shaft (antennomeres 1–6 combined), while in the rest of species antennal club is not reaching the length of antennal shaft.

Taxonomy, new species, Coleoptera, Scarabaeidae, Melolonthinae, Palaearctic region

The palaearctic melolonthine genus *Amphimallon* Lepeletier et Serville, 1825 is known to occur in Europe (including England and Scandinavia), North Africa, Asia Minor, Caucasus, Middle and Central Asia and northern China (Baraud 1992, Medvedev 1951, Nikolaev 1987). Almost 40 species inhabiting Europe can be classified in four groups (Baraud 1992).

A spectacular new species with remarkably long antennal club discovered in Greek Macedonia (Chalkidiki, Sithonia peninsula) is described in the present paper (Fig. 5).

Specimens of the described species are provided with one red label: "Amphimallon sithoniense sp. n., HOLOTYPUS or PARATYPUS [with handwritten No and sex symbol for male], David Král det. 1997 [p]". Exact label data are cited for the type material. Author's remarks and complementations are found in square brackets, [p] preceding data within quotation are printed.

Amphimallon sithoniense sp. n.
(Figs 1–5)

TYPE MATERIAL. Holotype and paratypes Nos 1–15 (all males), labelled "GR [=Greece] Sithonia [peninsula], Vourvourou [village], 20.VI.–4.VII.1992, P. Průdek leg. [p]". Holotype and paratypes Nos 1–8 deposited in David Král collection (Praha), paratypes Nos 9–13 in Petr Pacholátko collection (Brno) and paratypes Nos 14–15 in Milan Nikodým collection (Praha).

DESCRIPTION. Male. Body length 13.2–16.0 mm (holotype 15.2 mm). Body elongate, only inconspicuously dilated posteriad. Dorsal surface shiny; colour dark reddish brown, head (except for clypeus), anterior and lateral clypeal margins, narrow margin around whole pronotum and elytral suture dark blackish brown to black; side of pronotum with pale brown longitudinal strip. Ventral surface shiny, head appendages and extremities pale brown, external protibial dentes blackish apically. Setation pale, ventrally to whitish.

Head (Fig. 1). Labrum distinctly bilobed, laterally with several long setae. Clypeus bare, with considerably upturned margin, anteriorly shallowly but distinctly emarginate, angles rounded, sides slightly divergent posteriad; surface deeply, simply and regularly punctate, punctures separated by more than twice their diameter. Frontoclypeal suture present. Frons bare with distinctly developed, medially slightly interrupted transversal ridge; anteriorly with approximately same punctation as in clypeus but rather more irregular; punctation posteriorly consisting of large, irregularly

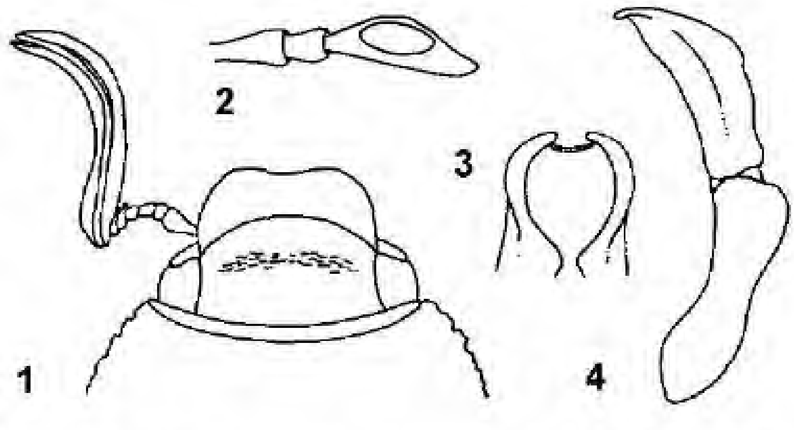
spaced, confluent punctures. Eye canthus bearing long, erect setae; angle between lateral margin of clypeus and canthus obtuse. Antenna (Fig. 1) with nine antennomeres; antennomere 2 trapezoidal and longer than antennomere 3, antennomere 3 and 4 almost oblong, antennomeres 5 and 6 transversal; club trimerous, considerably long (length of club : length of shaft ratio = 1.4 : 1.0), strongly curved externad, all antennomeres of club of the same length. Terminal maxillary palpomere elongate, with dorsolateral sensorium area elongate and opaque; palpomere 4 longer than palpomeres 2–3 combined (Fig. 2).

Pronotum transversal, widest approximately at middle, moderately narrowed anteriorly, each side with two shallow rounded depressions and in some specimens with hardly indicated longitudinal flattened area in basal half; all around rimmed; anterior margin almost straight, anterior corner broadly obtuseangled with rounded apex, side broadly rounded, posterior corner obtuseangled with rounded apex; lateral margin moderately serrate, each of 12–18 notches bearing very long, posterolaterad curved seta; surface bare except for row of sparse, short, erect setae in anterior rim and group of several recumbent setae medially near basal margin; punctation rather irregular, simple, consisting of coarse punctures, separated by approximately 1–3 their diameter.

Scutellum triangulate, apical margin rounded, covered with punctures similar to those in pronotum.

Elytron absent from humeral denticle; striae indicated by rows of densely (to confluent) and somewhat irregularly spaced punctures; intervals 1, 3, 5, 7 only inconspicuously convex, intervals 2, 4, 6 flat, interval 2 discally distinctly wider than the other; punctation coarse, irregular, often confluent; external margin with row of unequal, laterad or lateroposteriad oriented setae being shorter than in marginal row of pronotum; surface covered with very sparse, short, semierect setae, basally, in area adjacent to scutellum intermixed with sparse, very long (same length as in marginal row of pronotum), semierect setae.

Ventral surface of thorax completely covered with very dense, long, semierect to recumbent setation. All femora densely, irregularly punctate, with long semierect setation. Protibia tridentate, basal dens subobsolete; terminal calcar inserting against emargination between apical and medial dentes. Claws regularly curved, with perpendicular basal dens.



Figs 1–4. *Amphimallon sithoniense* sp. n. (holotype). 1 – habitus with left antenna, 2 – left maxillary palpus, 3 – apical part of aedeagus, 4 – aedeagus, lateral aspect; all figures except for Fig. 4 in dorsal aspect.

Propygidium finely, densely punctate; pygidium except for basal margin rimmed, apically with several long setae arising from rim, punctation fine, superficial to subobsolete. Ventrites 2–5 with transversal row of semierect long seate.

Aedeagus of typical shape in *Amphimallon* (Figs 3–4).

Female unknown.

DIFFERENTIAL DIAGNOSIS. *Amphimallon sithoniense* sp. n. is classified in *A. solstitiale* species group sensu Baraud (1992). The group comprises species with the following complex of diagnostic characters: pronotum at least in anterior rim setaceous, all elytral intervals shiny, odd intervals (1, 3, 5, 7) flat or only hardly convex; basal dens of protibia subobsolete or entirely absent; terminal calcar of protibia inserting against emargination between apical and medial dentes. The new species can be distinguished from all so far known species of the group by considerably long antennal club being longer than antennal shaft (antennomeres 1–6). In the rest of so far known species antennal club is shorter than antennal shaft.

NAME DERIVATION. The new species is named after Sithonia, the central peninsula of Chalkidiki, where the type locality lies.

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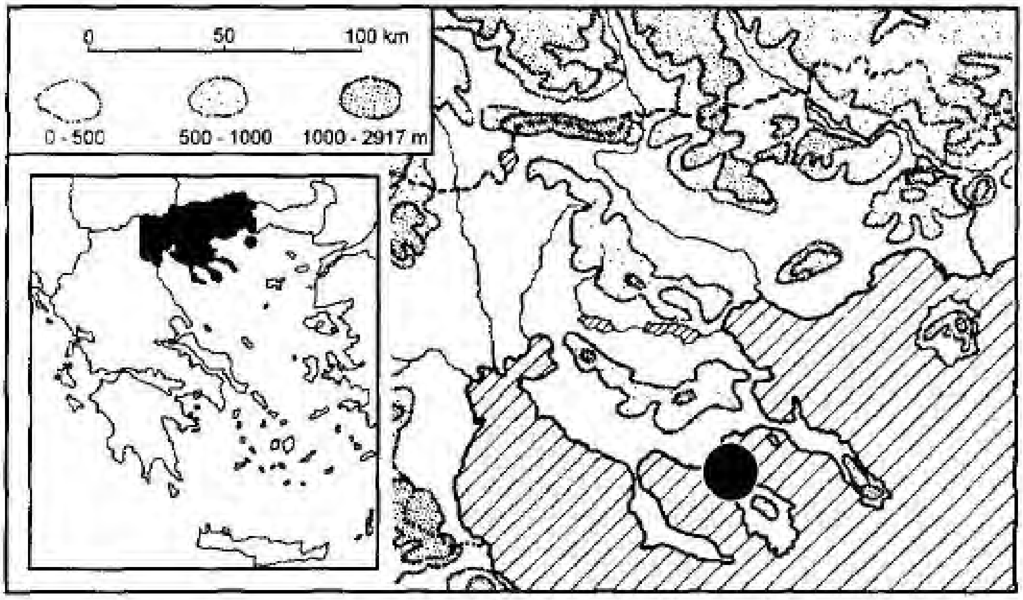

Fig 5. Sketch map of Greek Macedonia with the type locality of *Amphimallon sithoniense* sp. n.

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Observations on the seasonal maturation of the nematode *Rhabdochona zacconis* in Japanese dace, *Tribolodon hakonensis*, of the Okitsu River, Japan

František MORAVEC[1,2], Kazuya NAGASAWA[2] & Yuta URUSHIBARA[3]

[1]Institute of Parasitology, Academy of Sciences of the Czech Republic, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic
National Research Institute of Far Seas Fisheries, 5-7-1 Orido, Shimizu, Shizuoka 424, Japan
[3]School of Marine Science and Technology, Tokai University, 3-20-1 Orido, Shimizu, Shizuoka 424, Japan

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Abstract. Preliminary data on the seasonal changes in the occurrence and maturation of the fish nematode, *Rhabdochona zacconis* Yamaguti, 1935, in its definitive host, *Tribolodon hakonensis* (Günther), are provided, being based on monthly samples of fish (a total of 145 fishes were examined) collected in the Okitsu River, southern Honshu, Japan, from April – September 1994. In this locality, the nematode occurred in fish throughout the period of study, with the highest values of prevalence and mean intensity in July and May, respectively. Gravid females with mature eggs were present from April – June and again in August – September, being absent in July. New infections were acquired by fish throughout the period of study, but mainly during May – July. The seasonal changes in maturation of this nematode may be associated with the temperature regime in the locality and seasonal cycles of maturation of its intermediate hosts. These observations represent the first data on the seasonality of a *Rhabdochona* Railliet, 1916 species from a subtropical region.

Seasonal maturation, parasitic nematode, *Rhabdochona zacconis, Tribolodon hakonensis*, Palaearctic region

INTRODUCTION

The nematode *Rhabdochona zacconis* Yamaguti, 1935 is an intestinal parasite of some freshwater or migratory cyprinids, distributed in Japan (Honshu, Hokkaido), Far-Eastern part of Russia and western Canada (Yamaguti 1935, Moravec 1975, Moravec et al., 1981, Arai & Mudry 1983, Moravec & Nagasawa 1989). In Japan it occurs mainly in *Tribolodon hakonensis* (Günther) and less often in *Zacco platypus* (Temminck et Schlegel); Yamaguti (1935) reported it also from the catfish *Liobagrus reini* Hilgendorf but, in the fact, it concerned another congeneric species, *Rhabdochona japonica* Moravec, 1975.

Until now, there are no quantitative data on the occurrence of *R. zacconis* in the fish definitive hosts in Japan. The life cycle of this parasite is unknown, but it can be supposed to be similar to that in other *Rhabdochona* species, i.e. that an intermediate host, most probably mayflies, is involved in the cycle. The mayfly *Ephemera japonica* McLachlan has recently been found to serve as the natural intermediate host of three other Japanese species of *Rhabdochona* Railliet, 1916, *R. coronacauda* Belouss, 1965, *R. denudata honshuensis* Moravec et Nagasawa, 1989 and *R. oncorhynchi* (Fujita, 1921) (Shimazu 1996, R. Hirasawa, Nara Women's University, pers. comm.).

It is well-known that most helminth parasites live for only a short time in their fish host and that, in the temperate zone, in addition to the species capable of reproduction in any season, there are others in which the growth and maturation are restricted to a certain period of the year

Table 1. Monthly changes in infection of *Rhabdochona zacconis* Yamaguti in Japanese dace (*Tribolodon hakonensis* Gunther) from the Okitsu River, Shizuoka Prefecture, from April to September 1994

Month	No. of fish examined	No. of fish infected	Prevalence (%)	Total no. of worms found	Intensity mean (range)	BL (mm) of fish mean (range)
April	22	9	40.9	38	4.2 (1–12)	80 (53–105)
May	25	14	56.0	161	11.5 (1–73)	74 (48–133)
June	30	19	63.3	94	4.9 (1–20)	87 (56–128)
July	27	25	92.6	69	2.8 (1–13)	86 (50–131)
August	15	7	46.7	35	5.0 (1–18)	105 (44–170)
September	26	11	42.3	15	1.4 (1–5)	64 (44–135)
Total	145	85	58.6	412	4.8 (1–73)	81 (44–170)

when favourable climatic and other conditions occur (Moravec 1994). In spite of both theoretical and practical importance of such data, regarding the nematodes parasitizing freshwater fishes as adults, the seasonal maturation cycles have so far been studied in a few species and only under the conditions of a mild climate in Europe and North America. This concerns also the widely distributed species of *Rhabdochona*, where seasonal maturation cycles have been studied only in Central Europe (Czech Republic) and northern Spain (in *R. denudata* (Dujardin, 1845), *R. gnedini* Skrjabin, 1946, *R. hellichi* (Šrámek, 1901), *R. phoxini* Moravec, 1968 – see Moravec 1977, 1989, Pereira Bueno & Alvarez Pellitero 1979, Pereira Bueno 1980, Moravec & Scholz 1995), and also in N. America (Canada) (in *R. cascadilla* Wigdor, 1918, *R. rotundicaudatum* Byrne, 1992 – see Byrne 1992), whereas no data exist in this respect from subtropical or tropical regions. Because the water temperature is generally considered to be the principal factor controlling directly or indirectly the seasonal cycles of fish helminths (Kennedy 1970), data on the seasonal maturation cycle of a *Rhabdochona* species in the conditions of the subtropical region is of a special interest. The authors of this paper are aware of the fact that the material used in this work is rather limited and that subsequent studies with samples covering all months of the year are necessary to describe in detail the seasonal maturation cycle of this nematode species. Nevertheless, since the present data represent the first observations on the maturation cycle of a *Rhabdochona* species under the conditions of the subtropical region (southern Honshu, Japan), we consider them to be worth publishing.

MATERIALS AND METHODS

The Okitsu River is a medium-sized stream in Shizuoka Prefecture, southern Honshu, Japan, flowing down from the eastern slopes of the mountain area to the Pacific coast and opening into Suruga Bay near Shimizu. This region has a typical humid subtropical climate, with minimum winter air temperatures about 0–4 °C and minimum summer temperatures about 26° C. The fish fauna of the lower reaches of the Okitsu River is composed mostly of cyprinids, the most frequent species being dace, *Tribolodon hakonensis*, the species considerably tolerant to increased water salinity, frequently occurring in brackish waters near the mouth of the river. The upper reaches of this river are inhabited by salmonoid fishes (largely *Oncorhynchus masou ishikawai* Jordan et McGregor, *O. mykiss* (Walbaum), *Plecoglossus altivelis altivelis* Temminck et Schlegel).

Fishes to this study were caught by angling in the middle and lower reaches of the Okitsu River near Shimizu in the period from April until September 1994 (Table 1). In addition, a single specimen of *T. hakonensis* was obtained in February of the same year. The fishes were transported to the laboratory of the National Research Institute of Far Seas Fisheries at Shimizu, where they were subsequently examined for parasites. In addition to 146 specimens of *T. hakonensis*, occasional examinations of other fish species from this locality were performed: 11 specimens of *Zacco platypus*, 6 *Oncorhynchus masou ishikawai*, 3 *Oncorhynchus mykiss*, and 2 *Plecoglossus altivelis*.

Besides *Rhabdochona zacconis* in *T. hakonensis*, the following species of fish nematodes were recorded from the above hosts in this locality: *Pseudocapillaria tomentosa* (Dujardin, 1843) in *T. hakonensis*, *Rhabdochona* sp. (only larvae and juvenile females – possibly conspecific with *R. zacconis*) in *Z. platypus*, *Rhabdochona oncorhynchi* (Fujita, 1921) and

Cystidicoloides ephemeridarum (Linstow, 1872) in *O. mykiss* and *O. masou ishikawai*, and *Raphidascaris biwakoensis* Fujita, 1928 third-stage larvae in *P. altivelis*.

The ecological terms „prevalence", „intensity" and „mean intensity" is used here in accordance with the paper by Margolis et al. (1982).

The nematode material is deposited in the National Science Museum, Tokyo, Japan.

RESULTS

It is apparent from Table 1 that the infections by the nematode *Rhabdochona zacconis* occurred in *Tribolodon hakonensis* throughout the period of investigation, from April until September, with relatively high values of prevalence, ranging within 41–93%. Total prevalence was 59%, with the total intensity being 1–73 (mean 5) nematodes per fish. On comparing the values from individual months, it is obvious that the prevalence attained its maximum value (93%) in July and its minimum value (41%) in April. The highest value (12) of mean intensity occurred in May, then it gradually decreased during June and July, to increase somewhat again in August; the minimum value (1) of mean intensity occurred in September. *Rhabdochona zacconis* was also recorded from a single specimen of *T. hakonensis* examined in February.

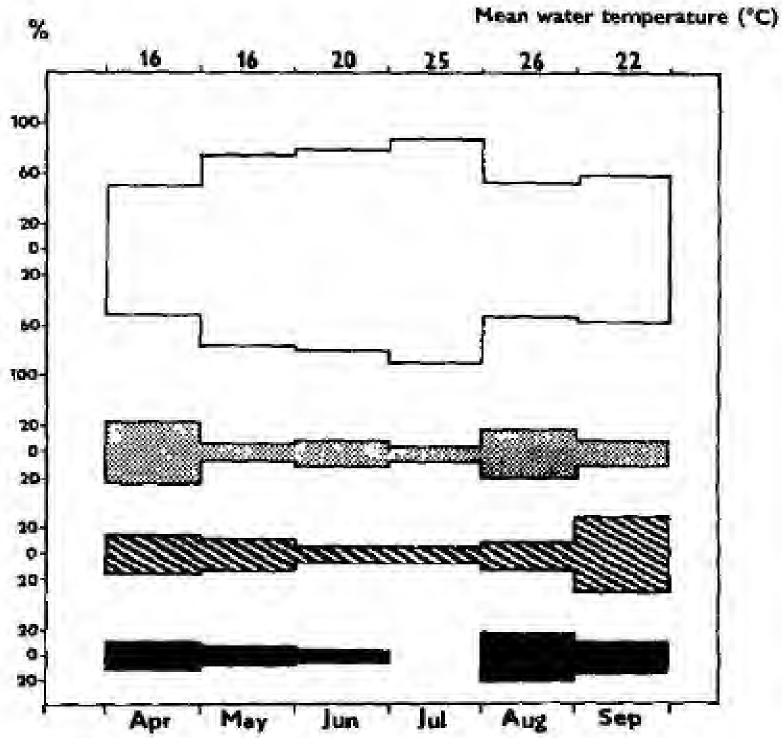

Fig. 1 Monthly changes in the occurrence and state of maturity of *Rhabdochona zacconis* Yamaguti in *Tribolodon hakonensis* Gunther of the Okitsu River in the period from April – September 1994. The data are expressed as percentages of the total number of nematodes found per month: larvae and females without eggs (unsheaded), males (stippled), females with immature eggs in uteri (obliquely hatched) and gravid females with mature eggs in uteri (black)

Monthly changes in the occurrence and the state of maturity of *R. zacconis* in *T. hakonensis* are obvious from Figs 1 and 2. They show that the larvae and non-gravid females of this parasite occurred in fishes throughout the period of investigation, from April to September, prevailing in all monthly samples, with the highest percentages (75–88%) from May to July (Fig. 1). Males and females with immature eggs were also present throughout the period of study, with higher percentages in samples in April (23%) and August (19%), and in April (17%) and September (30%), respectively (Fig. 1).

Gravid females of *R. zacconis* with mature eggs in uteri occurred in the spring (April – June), with the highest percentage (9%) in the sample in April, and again in the late summer and in the autumn (August – September), with a maximum percentage (19%) in August (Fig. 1). They were not recorded in July (Figs. 1, 2), although the fish sample from this month included 27 fish specimens (Table 1). The only available specimen of *T. hakonensis* examined in February harboured one gravid female of *R. zacconis* with mature eggs too.

Monthly changes in the absolute numbers of individual developmental stages of *R. zacconis* in *T. hakonensis* are apparent from Fig. 2, showing the mean numbers of individuals of a certain stage per fish in each month. It is obvious from this figure that there was a sudden increase in the numbers of larvae and juvenile females in May, representing the maximum number (4.80) of individuals of this group per fish; during June and July the numbers of larvae and juvenile females considerably decreased as compared with May, but still remained rather high; they continued to gradually decrease during the following two months to reach the minimum (0.31) in September. The maximum numbers of *R. zacconis* males (0.52) and females with immature eggs (0.88) were found in May; whereas the mean numbers of females with immature eggs decreased in June and remained low till September, the numbers of males gradually decreased in June – July and increased (0.47) again in August to reach the minimum (0.04) in September (Fig. 2).

Mean numbers of the females with mature eggs were low in April – June (0.14–0.24) and September (0.04); their maximum number (0.47 per fish) occurred in August (Fig. 2). Fig 2 shows clearly that most nematodes found in fish during the whole period of study were larvae and juvenile females, whereas the egg-producing females occurred only in small numbers, except for July, when they were completely absent.

DISCUSSION

Even though the present observations do not enable to determinate the whole maturation cycle of *Rhabdochona zacconis* throughout the year, they provide some important knowledge about seasonal changes in the maturation and the population dynamics of this nematode at its principal fish definitive host, *Tribolodon hakonensis*, from spring to autumn, in the environment of the stream in the subtropical region of southern Honshu. It is obvious from the present data that the parasite occurred in fish during the whole period of study (April – September and also in February) and it is highly probable that *R. zacconis*, similarly as most other congeneric species, is present in fishes of this locality all the year round, the adults representing, however, only a small part of the nematode specimens in fish.

The egg-producing female nematodes were also recorded in fish in all months where samples were taken, except for July. This indicates that the maturation cycle of *R. zacconis* may be similar to that of *R. denudata* and *R. gnedini* in cyprinids of the rivers in Spain (Pereira Bueno et al. 1979, Pereira Bueno 1980), where gravid females were present in fishes throughout the year, but their percentage was highest in spring and summer months and lowest in winter months; also Moravec (1989) reported a non-pronounced seasonal cycle of maturation in *R. denudata* in

Leuciscus cephalus (L.) of the Rokytná River in the Czech Republic, where gravid females with mature eggs were present throughout the year. Although no samples of *Tribolodon hakonensis* from the Okitsu River have been available from October until January, the finding of the egg-producing female of *R. zacconis* in the only fish examined in February suggests that the oviposition of this parasite occurs also during winter months. The increased occurrence of egg-producing females of *R. zacconis* in August probably reflects the increased recruitment of nematodes in May – July, this being evident from the proportion of larvae and juvenile females in the samples from this period; apparently, the *R. zacconis* larvae acquired by fish in spring and early summer can develop quickly to adulthood under summer water temperatures and, considering data on some other congeneric species (Moravec 1994), the prepatent period of *R. zacconis* at this time can be estimated to last about 1–2 months. The absence of egg-producing females of the nematode in July may show a tendency of this parasite to form in this locality two, hitherto not well separated generations a year, which may be associated with the seasonal maturation cycles of the intermediate hosts (probably mayflies).

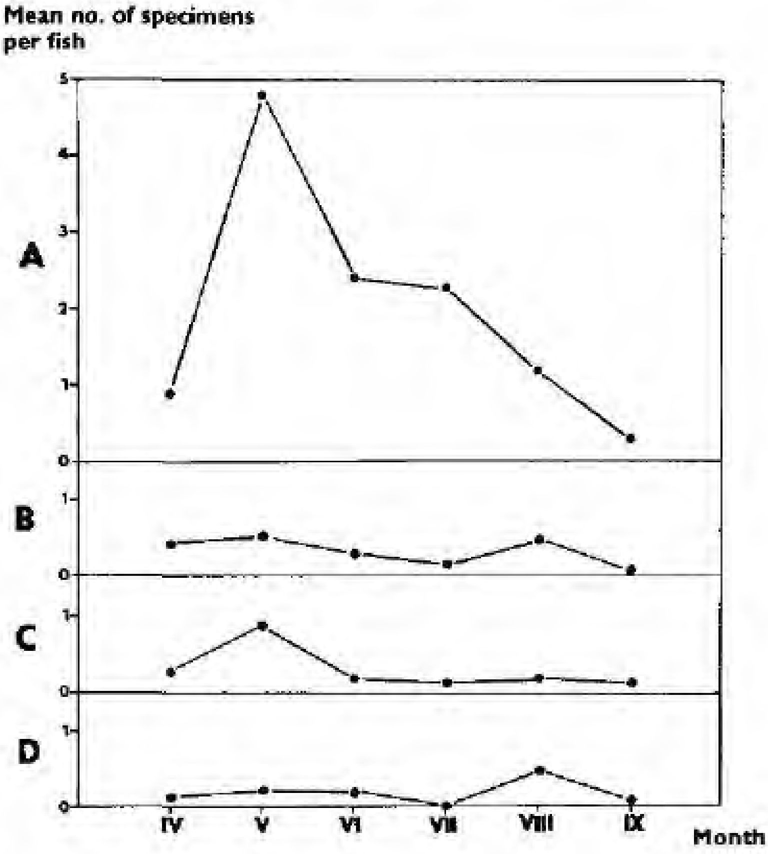

Fig. 2. Monthly changes in mean numbers of specimens of individual stages of *Rhabdochona zacconis* Yamaguti per fish. A = larvae and females without eggs, B = males, C = females with immature eggs, D = females with mature eggs.

The present data show (Figs 1, 2) that new *R. zacconis* infections in fish occurred throughout all months where regular samples were taken, i. e. from April until September, but mainly in spring and early summer (May – July), which may be associated with the emergence of adult mayflies or other aquatic insects (probable intermediate hosts of *R. zacconis*) and, consequently, their better availability to fish. This also reflects in the gradually increased values of prevalence and relatively high values of mean intensity of infection in this period (Table 1). Since fish may acquire *Rhabdochona* infection by feeding on both insect larvae and adults (Moravec 1994), it is almost sure that new *R. zacconis* infections in fish occur throughout the year.

In contrast to the *Rhabdochona* species with non-pronounced seasonal maturation cycles, to which *R. zacconis* undoubtedly belongs, there are other congeneric species with strictly seasonal maturation cycles the egg-producing females of which are present in fish only in the period of 1–3 months in the spring and the summer (Moravec 1977, Byrne 1992, Moravec & Scholz 1995). Like in other *Rhabdochona* species, the seasonal changes in the maturation of *R. zacconis* seem to be caused by the water temperature and mainly by seasonal changes in the availability of infective larvae in intermediate hosts (Moravec 1977, 1994).

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Behaviour of the dung-beetle *Scarabaeus cicatricosus* (Coleoptera: Scarabaeidae) under field conditions

Jiří REJSEK

Polabské muzeum, Palackého 68, CZ–290 01 Poděbrady, Czech Republic

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Abstract. Detailed observations of a pair of the scarab *Scarabaeus cicatricosus* Lucas, 1846 in NW Morocco are given. Data were obtained particularly on ball rolling and fighting behaviour. They were compared with published data, and tentatively interpreted.

Ethology, Coleoptera, Scarabaeidae, *Scarabaeus cicatricosus*, Morocco

INTRODUCTION

First detailed data on the mating and nesting behaviour of the representatives of the tribe Scarabaeini, particularly of *Scarabaeus sacer* Linnaeus, 1758, were presented by Fabre (1922). An important contribution has been the paper by Heymons & Lengerken (1929), which includes an extensive summary of detailed observations on several species, particularly *S. semipunctatus* Fabricius, 1792, and also *S. sacer*, *S. laticollis* Linnaeus, 1767, and *S. variolosus* Fabricius, 1787. Heymons & Lengerken (1929) described also fighting behaviour of dung-beetles. Our knowledge of the latter behaviour is summarized in the monograph by Lengerken (1954). Data on the nesting biology of representatives of the subfamily Scarabaeinae were summarized by Halffter & Matthews (1966) and Halffter & Edmonds (1982). Important data on the variations in ball rolling and nesting behaviour of *Kheper platynotus* (Bates, 1868) and *K. aegyptiorum* (Latreille, 1827) are contained in the papers by Japanese authors Sato & Imamori (1986a, b, 1987, 1988), and Sato & Hiramatsu (1993). Our knowledge of the nesting biology of *Scarabaeus cicatricosus* Lucas, 1846 is limited to an isolated comment on the bulldozer action in the first phase of the nesting gallery excavation in Halffter & Halffter (1989).

METHODOLOGY AND DESCRIPTION OF THE LOCALITY

Behaviour of the western Mediterranean (Baraud 1992) dung-beetle *Scarabaeus cicatricosus* was observed on May 18, 1995 ca. 17 km south of Tanger in north-western Morocco. The locality is a flat shore of the Atlantic Ocean, right of the road leading from Tanger to Larache. It is approximately 300 m broad and 4 km long. The shore is covered by thin, but continuous tree and shrub layer. The understorey is poorly developed. The locality is intensively used for cattle and sheep grazing. The soil is light and sandy.

The day was warm and sunny. Air temperature was 15 °C in 05.30, and raised to 32 °C in 13.00, when observations were finished. Beetles were observed from a distance of 80–120 cm. All individuals were collected subsequent to observations, if not stated otherwise, and their sex was identified by examination of their genitalia (material in coll. J. Rejsek).

Greenwich time is used throughout this paper. Air temperature was measured in shadow with a non-calibrated thermometer.

OBSERVATIONS

06.10 – Dawn.

07.40 – Creation of the observed dung-pat by a cow (*Bos*).

07.55 – Clouds allowed sun to appear. Subsequently, the sunshine was intensive. Air temperature in shadow was 17°C.

08.10 – Size of the dung-pat is ca. 25×20×6 cm. It lays in full sun. First representatives of coprophagous scarabeids appeared. First beetle was *Aphodius* (*Colobopterus*) *erraticus* (Linnaeus, 1758), but within 10 minutes some 30 individuals of several species appeared, including *A. erraticus*, *Caccobius schreberi* (Linnaeus, 1767), *Onthophagus taurus* (Schreber, 1759), *O. opacicollis* Reitter, 1893 and *O. maki* (Illiger, 1803). The number of beetles and taxonomic composition of their community changed continuously, because some beetles left the dung-pat, while other ones arrived.

08.17 – First male *Scarabaeus cicatricosus* (hereafter called „male") appeared, whose behaviour was subsequently observed. Till 08.30, five individuals of this species arrived at the dung-pat.

08.17–08.40 – Immediately after his arrival at the dung-pat, the male started to construct a ball, proceeding from the top of the dung-pat downwards, so that the ball became separated from the dung-pat only at the end.

08.40–08.53 – When the diameter of the ball was 25 mm, the male rolled it in the close vicinity of the dung-pat, fixed it with his hind legs and ventral side of his head, and used his forelegs to add additional dung. Final diameter of the ball was 40 mm, while the male's length was 24 mm.[1]

08.53–09.02 – The male rolled his ball over a rather flat ground at a distance of 13 meters. He rolled the ball backwards, having hind legs in front, and rubbing off with his forelegs and bended head.

09.02 – The male stopped at a moderate slope (inclination ca. 20°), and immediately started to dig a hole. The hole was oriented perpendicularly to the surface of the slope, not vertically. The male worked rapidly, with great concetration. He cracked surface of the fine, sandy soil with his forelegs and clypeus. Loosed soil was then moved by clypeus 15 cm apart from the incipient hole, where it formed a semicircle.

09.10 – The male was disturbed by another beetle of the same species (sex indetermined), who tried to rob his ball. Immediately after the intruder landed, the male interrupted digging and actively attacked it. After a short fight (4 min.)[2] the male has won, and returned to his work.

09.15 – A female (hereafter called „female") landed near the ball, although no attemps of the male to attract her were observed. The female crept on the ball and set there. The male registered her (he stopped to move for ca. 10 seconds, only swinging his antennae several times), but continued to dig the hole.

09.33 – Another foreign beetle tried to take the ball into its power, but the male saved it again. He fighted alone, while the female was sitting on the ball without any movement. Rather, the female sitting on the ball hindered the male, when he tried to put the ball into the hole.

09.42 – Another foreign pair of beetles landed (within 2 s). The male attacked one of the intru-ders (its sex remained unknown). The female started to engage in the defense, when the other

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[1] I observed the same style of ball enlargement also in *Scarabaeus sacer*. The observation was made ca. 50 km south of Agadir in south-western Morocco. A male, who rolled a completed ball, stopped at another dung-pat and used it to enlarge the ball. Additional enlargement of a ball was observed also in *Kheper aegyptiorum* (Sato & Imamori 1986b).

[2] In all observed cases, the fights were limited to frontal attacks (cf. Heymons & Lengerken 1929: 573).

foreign beetle tried to grasp the ball, on which she was sitting At first, the male and the female did not coordinate the defense Only after ca 7 minutes the male won his fight (his opponent flew away) and joined the female Together, they defeated the other intruder within ca 15–20 s, and it flew away

09 49–10 10 – Both beetles were apparently exhausted by the combat, and both rested moveless-ly on the place of the battle After some 10 minutes, the male slowly crept to the hole, and set there During the rest, both beetles only slowly swinged their antennae, and time to time slightly moved their heads or a leg

10 10 – The male started againt to dig the hole The female slowly climbed on the ball and stayed to sit there, showing no activity

10 20 – The male made another attempt to put the ball with the female into the hole, but its opening was still too small

10 25 – After all, the male succeeded to put his ball into the hole, and started to cover it with the formerly excavated sand

10 27 – Suddenly, the male interrupted his work, left the partly covered ball, and ran some 3 meters away There, another male rolled his ball, and our male tried to get it into his own power

10 31 – After a short combat, our male defeated the foreign male He rolled then his new ball to the first ball Immediately thereafter he started to dig out a new hole some 5 cm apart from the first one The female climbed on the new ball and started to sit there without moving

10 45 – The male probably encountered a hindrance, because he started to dig a new hole some 3 cm apart He did not work with so continuously as before, resting four times for 4–10 minutes during the following one hour

11 45 – The ball with the female was covered only in part, when the male suddenly returned to the first ball, digged it out, and started to roll it over difficult ground (stones, twigs) away

11 55 – After some 4 meters, the male was attacked by another beetle During the combat (ca 2 min later) landed at the place still another pair of beetles (within 1–2 s) The latter beetles immediately climbed on the ball, which was not defended in the moment (see above) The male defeated the first attacker, but not the pair, which fighted agains him together

12 01–12 08 – The male was sitting ca 30 cm apart from the ball, rested after the fight, and finally flew away Meanwhile, the foreign pair rolled the ball some 20 cm apart, and turned it several times The foreign male then cutted off by his clypaeum approximately one third of the hardening surface layer of the ball, and together with his female started to feed on the soft substrate

12 30 – The abandoned female (see note from 11 45) meanwhile get off the ball and slowly (much less intensively than the male) started to burrow it

12 55 – The ball was burried just under the surface, and the female slightly covered it with sand Then, the female burried herself in sand next to the ball, leaving just her head and a larger part of her pronotum uncovered She was then sitting in this manner without any signs of activity for several hours She was collected at 17 00

DISCUSSION

It is known, that closely related species may have markedly different mating and nesting behaviour Sato & Imamori (1988) observed, that males of *Kheper platynotus* do not construct nuptial ball, and that obligatory initiator of the brood ball construction are probably females On the other hand, males of *K aegyptiorum* construct nuptial ball and also seem to be obligatory initiators of brood ball construction In addition, intrapopulation variability may exist in the formation of sexual

relations and in nesting behaviour (Sato & Imamori 1987: *K. platynotus*), and in timing of copulation in relation to the progress of mating and nesting behaviour (Sato & Hira-matsu 1993: the same species). In view of this, behaviour of *Scarabaeus cicatricosus* described above is not easy to interprete, although it generally agrees with nesting pattern Nr. IV sensu Halffter & Edmonds (1982: 39–40). Nevertheless, some of the observations deserve comments.

Hindleg bending (Sato & Imamori 1986b) and other epigamic behaviour have not been observed. Also, the female did not appear to be attracted by any epigamic behaviour of the male. It can thus be assumed, that the male formed a food ball. On the other hand, movements of hindlegs during ball-rolling are quite similar to hindleg bending. It is thus possible, that the female was attracted by the male while he was rolling the ball (see also Halffter & Edmonds 1982: 40). Partners can mate after the ball(s) is/are burried. According to Sato & Hiramatsu (1993), they can copulate at any time between the construction of a ball and its burrial.

The hypothesis that this was a food ball is supported by the fact, that the male abandoned female sitting on one of the two balls. On the other hand, it is possible that the female considered the acquired ball ("voluntarily given out" by the male) a brood ball, because she lost her brood ball before, while it was a food ball for the male. In any case, this "altruistic" behaviour of the male is worth of mentioning. Considering the behaviour of the male to this female, it is possible to estimate that individual intrudors were males.

The fact, that the male burrying his ball left it temporarily to rob another ball, is also of interest. This observation makes it even more difficult to decide whether the above discussed ball was that of food or brood type.

It is not known, whether the existence of a nuptial ball is obligatory or at least facultative for nesting behavior of adult *S. cicatricosus*. On the other hand, it can be expected, that both observed pairs (see under 09.42 and 11.55) were indeed male and female, and that they planned to build nests. It is probable, though not certain, that their arrival and attempt to get the ball was a coordinated activity. To some degree, this would imply the existence of nuptial behaviour before building a nest.

At last, it is possible to expect that piratical obtaining of food or brood balls as food source is obligatory in densely populated areas. Dung in the form of balls is abundant, and acquiring it may be thus energetically favorable for dung-beetles, especially for paired individuals, because of their superiority in combats.

It is impossible to reach general conclusions on the basis of presented data, which are based on an observation of a few individuals, of which only two were observed for a longer period (several hours). However, it is possible to expect that adults of *S. cicatricosus* (and also those of other representatives of the genera *Scarabaeus* Linnaeus, 1758 and *Kheper* Janssens, 1940) are capable of a more complicated behaviour that presently believed, and that especially on places with a sufficient supply of dung-pats (frequented pastures) can the way from the ball construction to egg laying and brood-pear construction be highly variable and complicated. Closer understanding of this topic can be achieved only after a thorough investigation of the behaviour of these beetles under field conditions.

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BOOK REVIEW

HIMSTEDT W **Die Blindwuhlen. Die Neue Brehm-Bucherei, Bd. 630** Magdeburg Westarp Wissenschaften, 1996 159 pp Softcover, ISBN 3-89432-434-1 (in German)

Devoted to yet little known amphibians – the caecilians, this volume of the series Die Neue Brehm-Bucherei represents a valuable contribution to herpetological literature

The book is divided into 12 chapters Its main and major part contains the description of the structure and function of organ systems skin, skeleton and musculature, digestive and respiratory organs, heart and cardiovascular system, urogenital system, brain and sense organs The extent of this section reflects the main trends in investigation of these amphibians during last thirty years The special attention is paid to the structure and function of caecilians' eye It was just the author of this book who contributed considerably to knowledge of this caecilians' sense organ with a number of scientific papers

The caecilians possess many morphological and anatomical traits in which they differ not only from other amphibians but even from all the vertebrates For example, their skull shows a high degree of ossification and in this way, it is resemble to the skull of fossil stegocephalians The unique one is also the construction of the feeding apparatus (dual jaw-closing mechanism) In 1995, a great interest of herpetologists was awoken by the discovery of a lungless caecilian This species, *Atretochoana eiselti*, is known only from the type specimen deposited in the Museum of Vienna

Remarkable is also the reproduction of the caecilians In spite of all the other amphibians, the males possess an external copulative organ Worth to mention is also the fact that most of the species (about 75 per cent) of the caecilians are viviparous

In spite of the classic Taylor's monography from the year 1968 (Taylor E H 1968 *The Caecilians of the World* Lawrence University of Kansas Press, 845 p), where only three families were accepted, as many as six families are recognized by Werner Himstedt in the chapter "Classification and distribution" For each family the brief characteristics, survey of the genera as well as number of currently recognized species are given in this chapter Moreover, there are the maps of distribution for each family

In the remaining chapters there is summarized the current knowledge about the caecilians' diet, biotop requirements, burrowing behavior, locomotor activity, their endanger and protection Also the breeding in the captivity is described

Nevertheless, as the author himself emphasizes, the caecilians represent a "terra incognita" in a number of the points of view (e g , the feeding biology) Partly in consequence of their hidden way of life, partly because of the apparent inattractiveness, they escape the notice of people That is why they do not meet with the protection which they deserve because of their uniqueness as well as of the enormous threat to the tropical biotopes in general

The author of the book, professor of Zoology at the Technical University of Darmstadt, paid a special attention to the Asiatic species *Ichthyophis kohtaoensis*, which became so the best known species of caecilians

The book is extensively illustrated by 65 figures (maps of distribution, drawings, graphs, black-and-white photographs and a colour plate)

Summing up, this book provides insights into the recent knowledge about caecilians All references are fully cited, giving an important bibliography on this unique group of animals

The publication can be recommended to everybody who is interested in amphibians and herpetology in general

Radka Dandova

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Torpacarus species (Acari: Oribatida: Lohmanniidae) from Cuba

Josef STARÝ

Institute of Soil Biology, Academy of Sciences of the Czech Republic, Na sádkách 7, CZ–370 05 České Budějovice, Czech Republic; e-mail: jstary@upb.cas.cz

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Abstract. Six new species of oribatid mites, *Torpacarus lobatus* sp. n., *T. cylindricus* sp. n., *T. elegans* sp. n., *T. schatzi* sp. n., *T. foliatus* sp. n., and *T. pseudocallipygus* sp. n. are described and figured. A key to all known *Torpacarus* Grandjean, 1950 species is given.

Taxonomy, Acari, Oribatida, Lohmanniidae, Neotropical region

INTRODUCTION

Species of the *Torpacarus* Grandjean, 1950 are distributed particularly in the soils of the Neotropical and the Afrotropical regions. Type species, *T. omittens*, was described from Venezuela (Grandjean 1950) and later recorded from other parts of the Neotropical Region and Ghana. Wallwork (1962) described further three species *T. foveolatus*, *T. magnus* and *T. cinctus* from Ghana. Two forms were recorded later from the Neotropical region, *T. callipygus* from Guatemala (Mahunka 1983) and *T. omittens paraguyensis* from Paraguay (Balogh & Mahunka 1981). Recently Schatz (1994) has described *T. omittens galapagensis* and *T. remotus* from the Galapagos Islands, and *T. isabalensis* from Guatemala. *T. gramineus* was described from south Texas (McDaniel et al. 1979).

Altogether seven *Torpacarus* species were identified in a large soil mesofauna material collected by Dr Josef Rusek (Institute of Soil Biology, Czech Academy of Sciences, České Budějovice, Czech Republic) in Cuba. Apart from the type species *T. omittens*, all other species are new for science. This fact shows on considerably endemic features of Cuban soil oribatid fauna.

SYSTEMATIC PART

Torpacarus omittens omittens Grandjean, 1950

Torpacarus omittens Grandjean, 1950: 126, figs 4–5; Balogh, 1961: 30, figs 37–38; Wallwork, 1962: 486; Bischoff de Alzuet, 1971: 101.
Torpacarus omittens omittens, Balogh & Mahunka, 1981: 56; Balogh & Balogh, 1987: 343, pl. 26 C–D, Balogh & Balogh, 1988: 58, pl. 39 A–B.

MATERIAL EXAMINED. K-154 (2 spec.), Cuba, Guantanamo, 17 November 1979 garden of Instituto del Suelos, sample of moder and decaying wood from a tree, leg. J. Rusek, K-157 (1 spec.) Cuba, Guantanamo, 17 November 1979, garden of Instituto del Suelos, soil sample, leg. J. Rusek.

DISTRIBUTION. Neotropical Region (Venezuela, Belize, Cuba, Guadeloupe, St. Lucia, Peru, Argentina), Afrotropical Region (Ghana), (Grandjean 1950, Balogh 1962, Wallwork 1962, Bischoff de Alzuet 1971, Mahunka 1985a,b, Schatz 1994).

Torpacarus lobatus sp. n.

(Fig. 1)

DIAGNOSIS. One pair of protuberances on prodorsum, setiform barbed adanal setae, rostral margin undulated, superficial lines and polygonal sculptures absent on notogaster, areae porosae present on notogaster, marginal notogastral setae setiform.

DESCRIPTION. Average of body length 594.0 µm, range 556–617 µm, average of body width 236.0 µm, range 228–245 µm. Surface of body punctate, colour dull ochre yellow.

Prodorsum (Fig. 1A): large prodorsal protuberance with rounded tip situated near insertion points of anterior exobothridial setae. Rostrum moderately undulated (visible only in lateral view), rostral setae strong, extended in basal and central parts, with short ciliae in central part. Smooth but comparatively strong lamellar, interlamellar and anterior exobothridial setae shorter than rostral ones. Strong posterior exobothridial setae as long as sensillus, with short ciliae in basal part. Sensillus pectinate with 8–13 ciliae. One transverse band situated posterior to the level of botridiae.

Notogaster (Fig. 1A): finely punctate with 16 pairs of smooth setae with sharp tip, only setae c_3 basally finely ciliated. Marginal setae c_3, d_3, e_2, f_2, h_3, h_2, ps_{1-3} strong, long, longer than sensillus setae c_2, d_2, f_1, and h_1 more than 2× shorter than c_3, and 2× longer than centrodorsal setae c_1, d_1, and e_1. Areae porosae arranged in 3–5 irregular rows, superficial line absent, lyrifissure im present.

Infracapitulum finely punctate, setae m_2 shrub-like, all other setae short and smooth.

Epimeral region (Fig. 1B): epimeral setae formula 3–1–4(5)–4. Setae 1a, 3b–d (3e) shrub shaped, all other epimeral ones short and smooth. In some cases setae 3e present.

Ventral plates (Fig. 1B): genital plates not divided by transverse line, with 10 pairs of smooth and fine genital setae, 6 pairs in middle, 4 pairs in marginal rows. Five pairs of strong anal setae, finely and shortly ciliated in basal part. Seta an_5 the longest and seta an_1 the shortest anal setae. Lyrifissures ia, ih and ips present.

Legs all monodactylous without claw teeth, all femora with ventral ridges.

TYPE MATERIAL. Holotype: K-334, Cuba, Province Pinar del Rio, Vayesito, 18 November 1981, submontane forest, rendzina, multi sample, leg. J. Rusek. Two paratypes from K-333, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 November 1981, submontane forest, brown rendzina with grasses, leg. J. Rusek. Type material is deposited in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

AFFINITIES. The new species has unique feature in the genus *Torpacarus*, presence of one pair of prodorsal protuberance. This feature clearly separates new species from its congeners. The closest related species are *T. omittens omittens* and *T. omittens paraguayensis*. First one differs from the new species by the presence of superficial lines and absence of notogastral areae porosae, second one differs by the absence of notogastral areae porosae and roughed posterolateral notogastral setae (Grandjean 1950, Balogh & Mahunka 1981).

Torpacarus cylindricus sp. n.

(Fig. 2)

DIAGNOSIS. Adanal setae shrub-like with a long spine-like branches, notogastral areae porosae and superficial lines nt present, rostral margin undulated, posteromarginal notogastral setae fine and short, notogaster finely punctate.

DESCRIPTION. Average of body length 791.7 µm, range 775–808 µm, average of body width 330.0 µm, range 328–332 µm, surface of body finely punctate, colour light brown.

Prodorsum (Fig. 2A): rostrum undulated, all prodorsal setae smooth, rostral setae 2× longer than lamellar ones. Posterior exobothridial setae the longest, interlamellar setae the shortest prodorsal ones. Pectinate sensillus with 12–18 short ciliae. Posterior to the level of bothridiae situated one transverse band.

Notogaster (Fig. 2A): finely punctate with 16 pairs of smooth, comparatively short notogastral setae. Marginal setae c_3, d_3, f_2, h_3 as long as anterior exobothridial setae. Centrodorsal setae c_{1-2}, d_{1-2}, e_{1-2}, f_1, h_1 very short and fine. Lyrifissure im and 7 rows of areae porosae present, superficial line nt present.

Infracapitulum: setae a smooth, all other setae on infracapitulum ciliated.

Epimeral region (Fig. 2B): epimeral setae formula 3–1–4–4, setae 1a, 3b, 3c, 3d, 4c and 4d ciliated or shrub-like, all others epimeral ones smooth and fine. Lyrifissures ia, ips and ih present.

Ventral plates (Fig. 2B): genital plates with 10 pairs of fine and smooth genital setae, 6 pairs in middle, 4 pairs in marginal rows. Five pairs of ciliated anal setae present.

Legs all monodactylous. Claws without teeth, all femora with ventral ridges.

TYPE MATERIAL. Holotype K-187, Cuba, Province Cienfuegos, botanical garden Soledad, 30 November 1979, near a brook, mull, rendzina sample, leg. J. Rusek. Two paratypes from the same locality as a holotype, one from K-154,

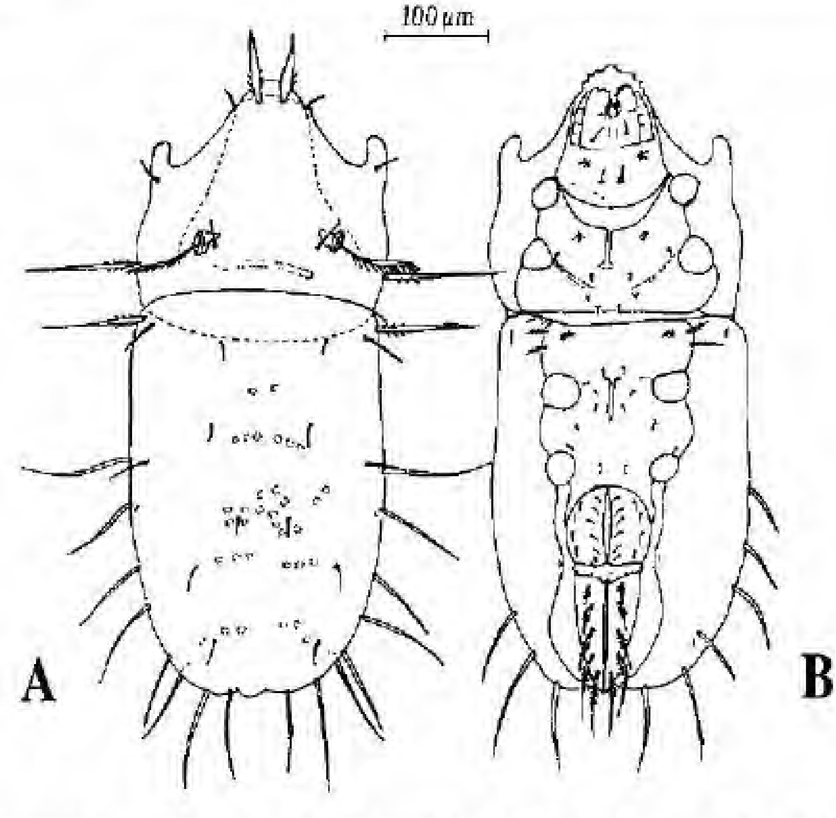

Fig. 1. *Torpacarus lobatus* sp. n. Dorsal view on the body without legs (A), ventral view on the body without legs (B). Scale, 100 µm

Cuba, Guantanamo, 17 November 1979, garden of Instituto del Suelos, sample of moder and decaying wood from a tree, leg. J. Rusek. Type material is deposited in the author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

AFFINITIES. The new species belongs to the *Torpacarus* species group with shrub-like adanal setae. Only one species of this group *T. schatzi* sp. n. has undulated rostral margin as a new species. We can easily distinguished new species from this one by the absence of polygonal sculpturae and presence of areae porosae on notogaster. *T. cubanus* sp. n. differs too by the longer posteromarginal notogastral setae ps_1 and ps_2. Only *T. elegans* sp. n. has punctate body surface with areae porosae and undulated rostral margin as a new species, but this species has leaf-like adanal setae, whereas new species has shrub-like adanal setae.

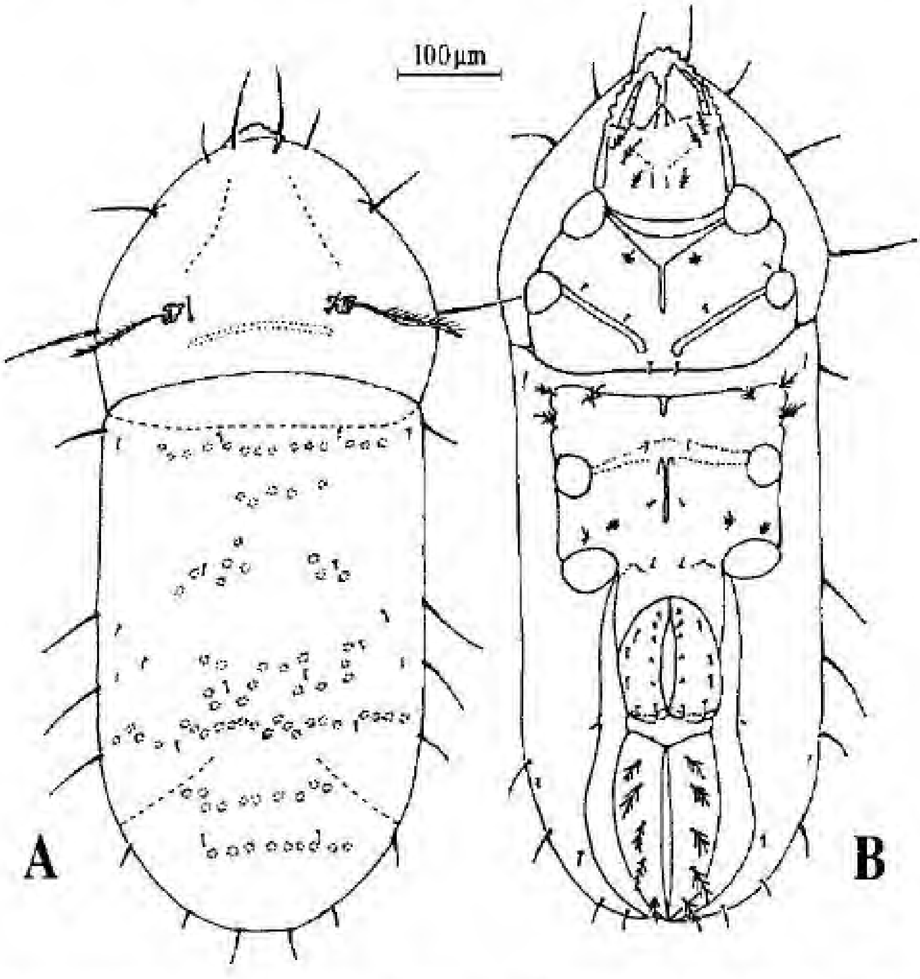

Fig. 2. *Torpacarus cylindricus* sp. n. Dorsal view on the body without legs (A), ventral view on the body without legs (B). Scale, 100 µm.

Torpacarus elegans sp. n.
(Fig 3)

DIAGNOSIS Prodorsal and lateromarginal notogastral setae leaf-like, adanal setae life-like with long spine-like branches, finely punctate notogaster with areae porosae and superficial line nt

DESCRIPTION Average of body length 675 8 µm, range 641–692 µm, average of body width 290 3 µm range 281–300 µm Body surface punctate, colour dull ochre yellow

Prodorsum (Fig 3A) rostral margin undulate (visible only from ventral side), all prodorsal setae leaf-like with toothed margin Central axis of the setae ended with long and sharp, straight tip Tip of the interlamellar setae and anterior exobothridial setae bent upwards Pectinate sensillus with 16–21 ciliae Posterior to the level of bothridiae situated one transversal band

Notogaster (Fig 3A) finely punctate with 16 pairs of notogastral setae Setae c_3, d_3, e_2, f_2, h_3, ps_2 and ps_3 leaf-like with barbed margin, setae ps_1 and h_1 leaf-like, smooth and narrower All other notogastral setae short, smooth and fine. Lyrifissure im, 5–6 rows or groups of areae porosae and superficial lines nt and mt present

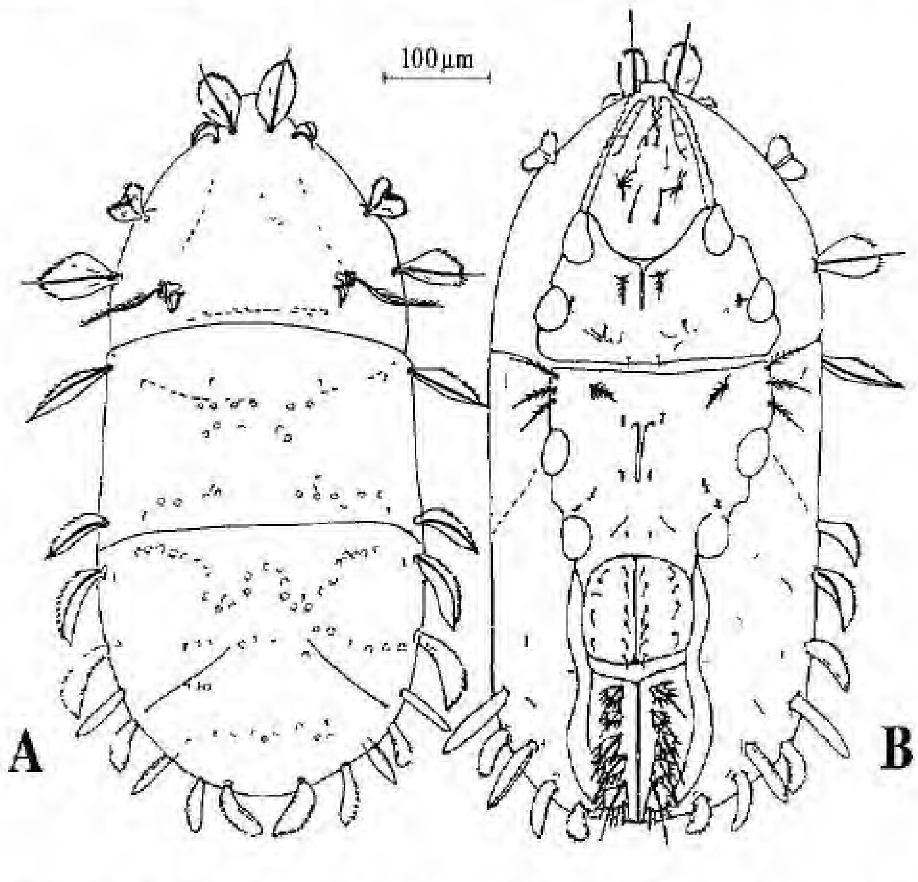

Fig 3 *Torpacarus elegans* sp n Dorsal view on the body without legs (A), ventral view on the body without legs (B) Scale, 100 µm

Infracapitulum: setae m_2 shrub-like, all other ones smooth and fine.

Epimeral region (Fig. 3B): epimeral setae formula 3–1–5–4, setae 1a, 1c, 3b, 3d, 3c, 4b, 4c, 4d shortly ciliated, all other epimeral ones short and fine. Setae 3b, 3c, 3d and 3c, 3× longer than 2a.

Ventral plates (Fig. 3B): genital plates with 10 pairs of smooth and short genital setae, 6 pairs in middle, 4 pairs in marginal rows. Lyrifissures ia, ih, and ips present. Five pairs of leaf like anal setae with long ciliae.

Legs all monodactylous, all femora with large ventral ridges.

TYPE MATERIAL. Holotype from K-315, Cuba, Province Habana, Arroyo Bermejo, 16 November 1981, semideciduous forest, rendzina, soil sample, leg. J. Rusek. Five paratypes, one from the same locality as a holotype, others from K-313, Cuba, Province Habana, Arroyo Bermejo, 16 November 1981, semideciduous forest, north slope, soil sample, leg. J. Rusek, K-323, Cuba, Province Habana, Arroyo Bermejo, 16 November 1981, semideciduous forest, north slope, soil sample, leg. J. Rusek. Type material is deposited in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

AFFINITIES. This new species has unique in the genus *Torpacarus* shape of adanal setae. This type of adanal setae differs new species from its congeners. Only *T. foliatus* sp. n. has leaf-like lateromarginal notogastral setae, but these setae are wider than new species ones. New species differs from *T. foliatus* by absence of polygonal sculpturae on the body and presence of rounded rostral margin. *T. cylindricus* sp. n. has undulated rostral margin and body surface without polygonal sculpturae as a new species, but we can easily distinguish these two species by form of lateromarginal notogastral setae. *T. cylindricus* sp. n. has these setae fine, smooth and setiform.

Torpacarus schatzi sp. n.

(Fig. 4)

DIAGNOSIS. Adanal setae shrub-like with a long spine-like branches, rostral margin undulated, notogaster with polygonal sculpturae, notogastral setae smooth, superficial notogastral lines absent.

DESCRIPTION. Average of body length 593.8 µm, range 493–669 µm, average of width 228.2 µm, range 194–257 µm, body surface with polygonal sculpturae, colour dull ochre yellow.

Prodorsum (Fig. 4A): with undulated margin, all prodorsal setae setiform, smooth, only anterior exobothridial setae finely barbed in basal part. Posterior exobothridial setae the longest prodorsal ones. Posterior to the level of bothridiae situated one transverse band.

Notogaster (Fig. 4A): cylindrical with 16 pairs of smooth notogastral setae and polygonal sculpturae on surface. Superficial lines not visible, marginal notogastral setae c_3, d_3, e_2, f_2, h_3, h_2, and ps_{1-3} longer than other centrodorsal setae, c_1 4× shorter than c_3, c_3 comparatively the same length as posterior exobothridial setae. Lyrifissure im present.

Epimeral region (Fig. 4B): epimeral setae formula 3–1–4–4, setae 3b, 3c, and 3d shrub-like with long ciliae. Setae 1a ciliated with short ciliae, all other epimeral setae short and smooth. Surface of epimerae finely punctate.

Ventral plates (Fig. 4B): comparatively small genital plates with 10 pairs of fine and smooth genital setae, 6 pairs in middle and 4 pairs in marginal rows. Lyrifissures ia, ih and ips present. Anal plates with 5 pairs of ciliated anal setae, with 2–4 pairs of long ciliae. Surface of ventral plates finely punctate.

Legs all monodactylous, all femora with ventral ridges.

TYPE MATERIAL. Holotype, K-313, Cuba, Province Habana, Arroyo Bermejo, 16 November 1981, semideciduous forest, north slope, soil sample, leg. J. Rusek. Eleven paratypes, one from the same locality as a holotype, others

from K-154, Guantanamo, 17 November 1979, garden of Instituto del Suelos, sample of moder and decaying wood from a tree, leg. J. Rusek, K-267, Cuba, Province Cienfuegos, Yaguaramas, 2 October 1981, forest, mull sample, leg. J. Rusek. Type material is deposited in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

Etymology. The new species was named in honour of Dr Heinrich Schatz (Innsbruck, Austria) renowned soil ecologist and acarologist.

Affinities. The new species belongs to the *Torpacarus* species group with shrub-like adanal setae and polygonal sculpturae on body surface. New species differs from these species (*T. foveolatus*, *T. magnus*, *T. cinctus* from Ghana and *T. foliatus* from Cuba) by the undulated rostral margin and by the absence of notogastral areae porosae (Wallwork 1962). *T. foliatus* sp. n. has too leaf-like lateromarginal notogastral setae, too, whereas *T. cubanus* sp. n. has normal smooth setiform lateromarginal ones on notogaster.

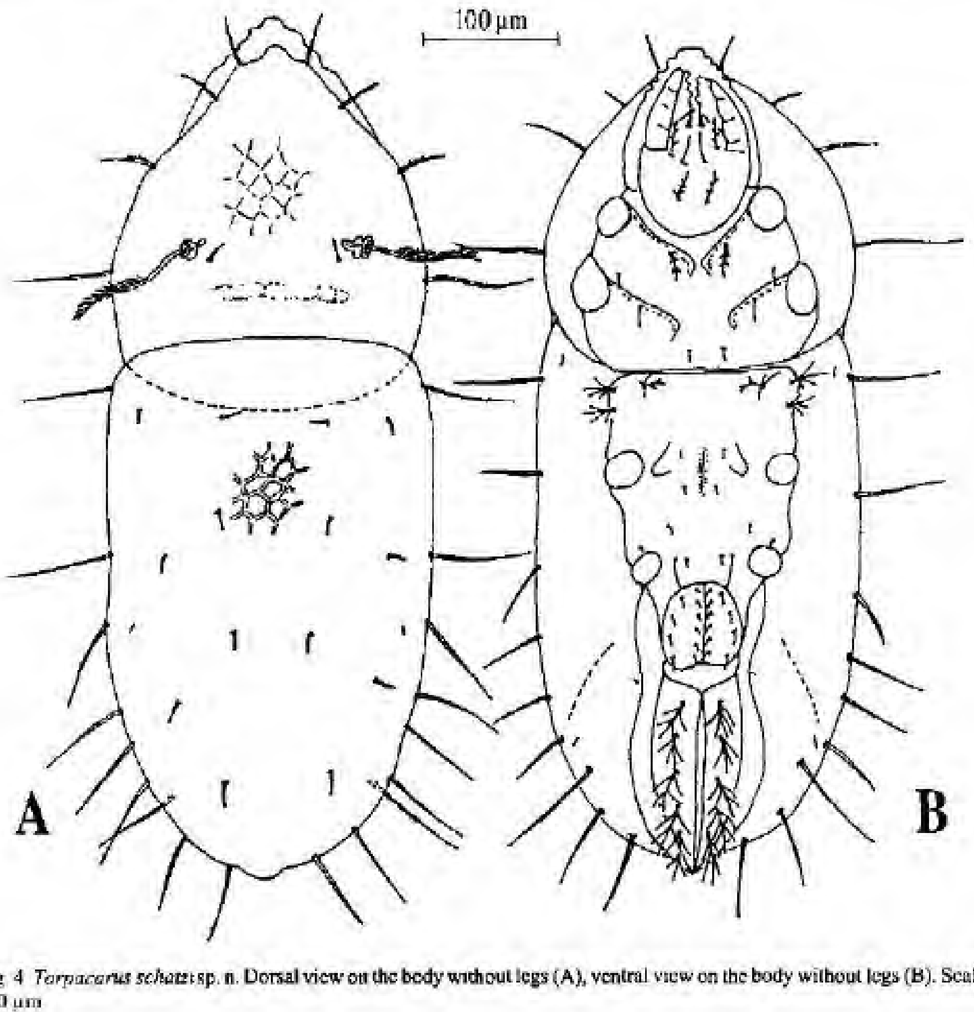

Fig. 4 *Torpacarus schatzi* sp. n. Dorsal view on the body without legs (A), ventral view on the body without legs (B). Scale: 100 µm

Torpacarus foliatus sp. n.
(Fig. 5)

Diagnosis. All prodorsal and lateromarginal notogastral setae leaf-like, adanal setae shrub-like with a long spine-like branches, areae porosae and polygonal sculpturae present on notogaster, rostral margin smooth.

Description. Average of body length 686.0 µm, range 651–725 µm, average of body width 310.5 µm, range 300–328 µm, body surface with polygonal sculpturae, colour yellowish brown.

Prodorsum (Fig. 5A): rostral margin smooth without distinct undulation. All prodorsal setae leaf-like, wide with many small teeth on anterior margin. Anterior and posterior exobothridial setae with prominent central spur. Pectinate sensillus with 10–13 ciliae. Posterior to the level of bothridiae situated transverse band. All prodorsal surface with distinct reticulation.

Notogaster (Fig. 5A): cylindrical with 16 pairs of notogastral setae, marginal setae c_3, d_3, e_2, f_2, h_3, h_2, and ps_{1-3} leaf-like, wide with small teeth on apical margin. All other notogastral setae very short, smooth and fine. Notogastral surface with distinct polygonal sculpturae, 3–4 rows of small areae porosae and pore-point im present, superficial lines absent.

Infracapitulum: setae m_{1-2} and h shortly ciliated, setae a smooth.

Epimeral region (Fig. 5B): epimeral setae formula 3–1–4–4, setae 1a, 3b, 3c, 3d, and 4c ciliated. All other epimeral ones smooth and fine.

Ventral plates (Fig. 5B): genital plates with 10 pairs of smooth genital setae, anal plates with 5 pairs of shrub-like anal setae wider in basal part with 3–4 long ciliae. Lyrifissures ia, ih and ips present.

Legs all monodactylous, claws without teeth, all femora with distinct ventral ridges.

Type material. Holotype from K-340, Cuba, Province Pinar del Rio, Sierra del Rosario, Vayesito, 18 November 1981, submontane forest, mull-like moder sample, leg. J. Rusek, and nine paratypes, three from the same locality as a holotype, others from K-327, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 November 1981, submontane forest, rendzina sample, leg. J. Rusek, K-332, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 November 1981, submontane forest, brown rendzina sample, leg. J. Rusek, K-333, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 November 1981, submontane forest, brown rendzina with grasses, leg. J. Rusek. Type material is deposited in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

Affinities. The new species belongs to the *Torpacarus* species group with shrub-like adanal setae and rounded rostral margin. All other species of this group (*T. foveolatus*, *T. magnus*, *T. cinctus* from Ghana) have setiform lateromarginal notogastral setae (Wallwork 1962). Only *T. elegans* has broaden leaf-like lateromarginal notogastral setae, but we can easily distinguish this species from *T. foliatus* by the form of adanal setae, by undulated rostral margin and by the absence of polygonal sculpturae on body surface.

Torpacarus pseudocallipygus sp. n.
(Fig. 6)

Diagnosis. Posteromarginal notogastral and anal setae long-ciliate, rostral margin undulated, superficial notogastral lines absent, surface of punctate notogaster without rows of areae porosae.

Description. Average of body length 406.5 µm, range 399–415 µm, average of body width 153.5 µm, range 152–155 µm, colour dull ochre yellow. Cerotegument with dense pits or punctate.

Prodorsum (Fig. 6A): robust, wider than notogaster, rostral margin undulated. Rostral setae straight with sharp tip and short ciliae in basal part, lamellar ones bent and smooth, anterior

exobothridial setae bent and rough, posterior exobothridial setae as long as sensillus smooth and the longest ones on prodorsum. Interlamellar setae fine, smooth and the shortest ones on prodorsum. Sensillus pectinate with 18–20 ciliae.

Notogaster (Fig. 6A): cylindrical with 16 pairs of notogastral setae. Setae c_1, d_1, e_1 and f_1 short, smooth and fine, setae c_2, c_3, d_2, d_3, e_2, and h_1 smooth and long, c_3, d_3, and e_2 as long as sensillus, d_2, c_2 and h_1 shorter. Setae f_2 long with short ciliae in basal part. Setae ps_1, ps_2, ps_3, h_2, and h_3 with very long ciliae. Lyrifissure im present, but badly observable. Superficial line absent.

Infracapitulum: finely punctate, setae h, m_{1-2}, and a, smooth, short and fine.

Epimeral region (Fig. 6B): epimeral setae formula 3–1–4–4. Seta 1b situated on the border between epimerae I and II. Epimeral setae 3b, 3c and 3d shrub shaped, all other epimeral ones short, smooth and fine.

Ventral plates (Fig. 6B): genital plates undivided with 9 pairs of genital setae, 5 pairs of shorter genital ones situated medially, and 4 pairs marginally. Five pairs of long ciliated anal setae with long ciliae. Lyrifissures ia well, ih badly and ips not observable.

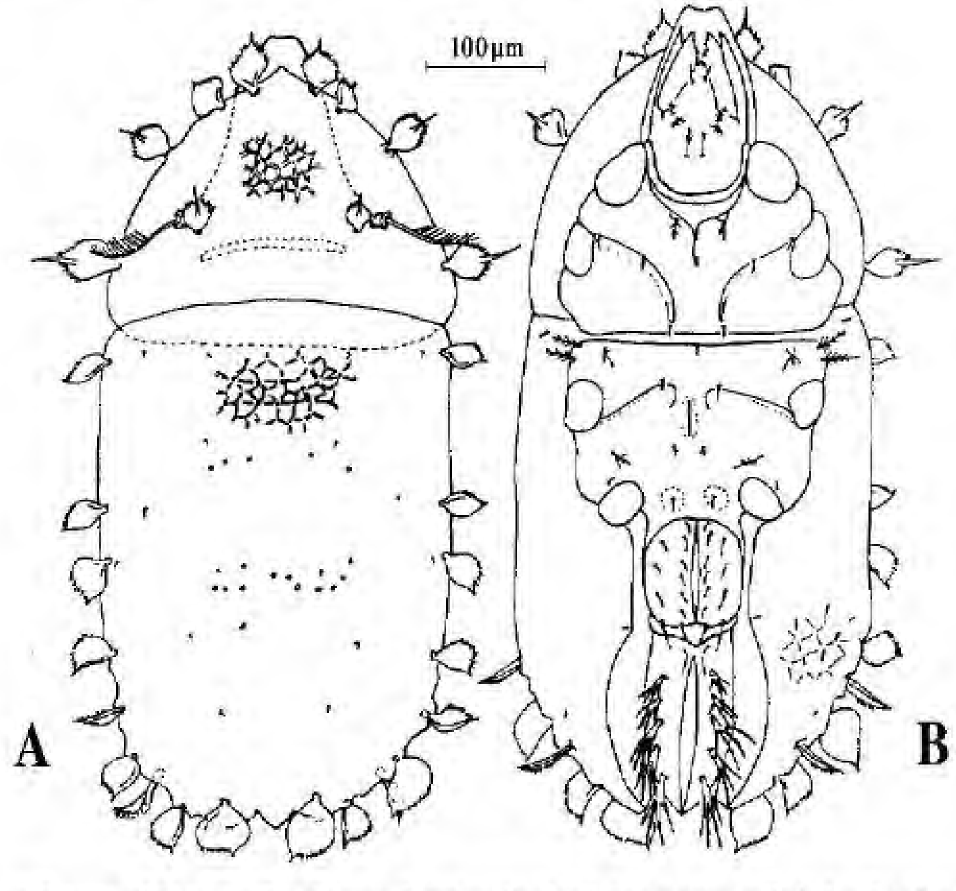

Fig. 5. *Torpacarus foliatus* sp. n. Dorsal view on the body without legs (A), ventral view on the body without legs (B). Scale, 100 μm.

Legs all monodactylous, comparatively short, all claws without teeth. All femora with ventral ridge; ridges on femora I and II large and blunt, but that on femora II and IV short and sharp.

TYPE MATERIAL. Holotype from K-159, Cuba, Province Santiago de Cuba, Playa Verraco, 18 November 1979, dry forest, soil sample, leg. J. Rusek, and one paratype from the same locality as a holotype. Type material is deposited in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

AFFINITIES. The new species is closely related to *T. callipygus* from Guatemala, but differs from it by smooth lamellar, posterior exobothridial, and notogastral setae. *T. callipygus* has these setae long-ciliated.

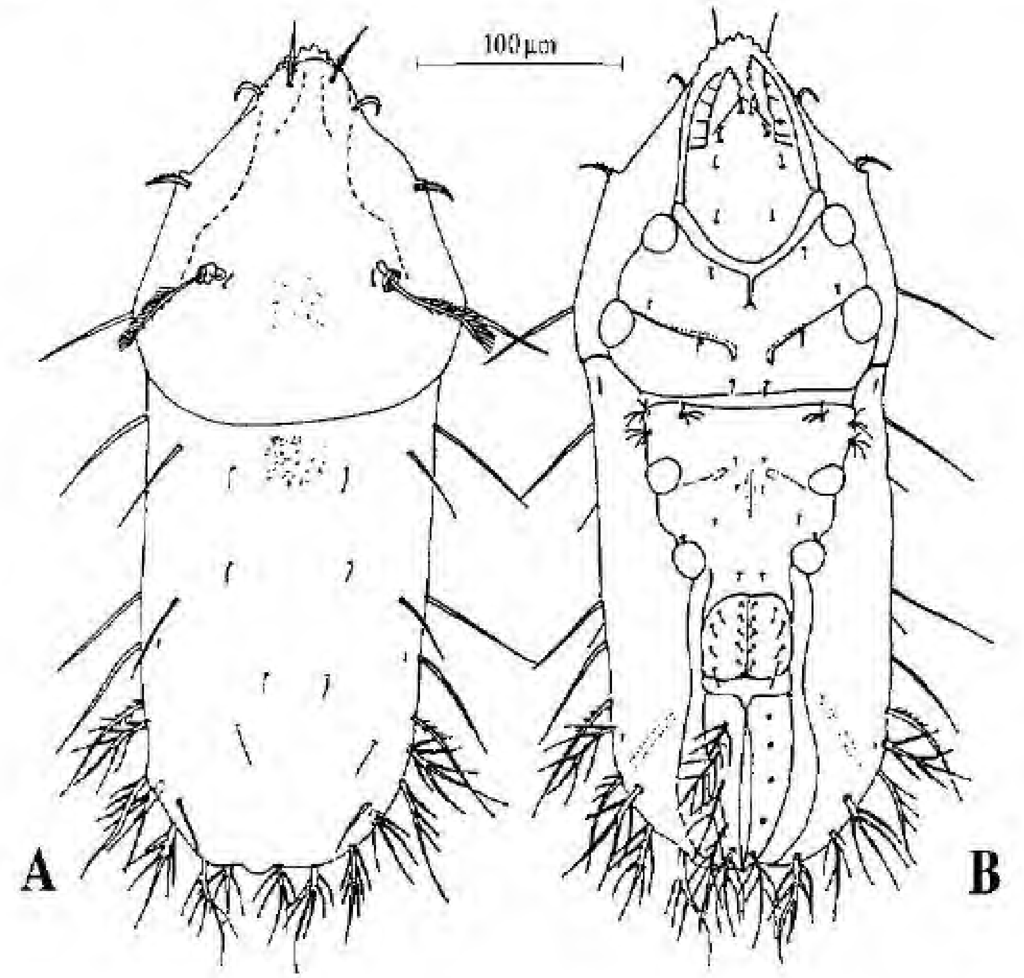

Fig. 6. *Torpacarus pseudocallipygus* sp. n. Dorsal view on the body without legs (A), ventral view on the body without legs (B). Scale, 100 µm

Key of the *Torpacarus* species

1 Adanal setae leaf-like, extended, with some long spine-like branches .... *T. elegans* sp. n.
– Adanal setae not leaf-like, setiform, smooth, barbed or shrub-like. 2
2 Adanal setae shrub-like with long spine-like branches. 3
– Adanal setae setiform, smooth or barbed, with short ciliae. 9
3 Surface of body with conspicuous polygonal sculpturae 5
– Surface of body finely punctate, without polygonal sculpturae. 4
4 Posteromarginal notogastral setae setiform .... *T. cylindricus* sp. n.
– Part of posteromarginal notogastral setae dilated. .... *T. izabelensis* Schatz, 1994
5 Lateral rostral margin undulated. .... *T. schatzi* sp. n.
– Lateral rostral margin rounded. 6
6 Prodorsal and lateromarginal notogastral setae leaf-like. .... *T. foliatus* sp. n.
– Prodorsal and lateromarginal notogastral setae setiform. 7
7 Notogaster without superficial lines mt and nt, interlamellar and rostral setae equal in the length .... *T. foveolatus* Wallwork, 1962
– Notogaster with superficial lines mt or nt, interlamellar setae considerably longer than rostral ones 8
8 Notogaster with one superficial line mt, interlamellar setae longer than distance between their insertion points. .... *T. magnus* Wallwork, 1962
– Notogaster with two superficial lines mt and nt, interlamellar setae shorter than distance between their insertion points .... *T. cinctus* Wallwork, 1962
9 Prodorsal margin with one pair of conspicuous protuberance .... *T. lobatus* sp. n.
– Prodorsal margin without protuberance 10
10 Base of posterior marginal notogastral setae widened, heavily ciliate. 11
– All posterior marginal notogastral setae setiform, barbed with short ciliae. 12
11 Notogastral surface with polygonal surface. .... *T. callipygus* Mahunka, 1983
– Notogastral surface densely punctate .... *T. pseudocallipygus* sp. n.
12 Notogastral setae rows c_{2-3}, d_{2-3}, and e_2 smooth, seta c_3 distinctly shorter than sensillus. .... *T. remotus* Schatz, 1994
– Notogastral setae rows c_{2-3}, d_{2-3}, and e_2 smooth, seta c_3 as long as or longer than sensillus. 13
13 Notogastral setae c_3 and d_3 very short, not extend beyond notogastral margin .... *T. gramineus* McDaniel, Norton et Bolen, 1979
– Notogastral setae c_2 and d_3 very short, extend beyond notogastral margin. 14
14 Notogaster with superficial lines mt, nt, and pt, setae c_2 half as long as c_1 .... *T. omittens omittens* Grandjean, 1950
– Notogaster without superficial lines, setae c_2 at most one third as long as c_1 15
15 Notogastral setae f_1 as long as f_2 extend beyond notogastral margin, all epimeral setae discrenibly ciliate. .... *T. omittens paraguyaensis* Balogh et Mahunka, 1981
– Notogastral setae f_1 three times shorter than f_2, not extend beyond notogastral, margin, epimeral setae 1a, 1c, 2a, 3a, 4a smooth. .... *T. omittens galapagensis* Schatz, 1994

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Three new species of the genus *Hermannobates* from Cuba (Acari: Oribatida: Hermanniellidae)

Josef STARÝ

Institute of Soil Biology, Academy of Sciences of the Czech Republic, Na sádkách 7, CZ-37005 České Budějovice, Czech Republic, e-mail: jstary@upb.cas.cz

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Abstract. Three new species of oribatid mites, *Hermannobates hammerae* sp. n., *H. ruseki* sp. n., and *H. cubanus* sp. n. are described. A key to the known *Hermannobates* Hammer, 1961 species is given.

Taxonomy, new species, oribatid mites, Hermanniellidae, *Hermannobates*, Neotropical region

INTRODUCTION

Only four species of the genus *Hermannobates* Hammer, 1961 were described so far, all of them from the Neotropical region. The type species *H. monstruosus* Hammer, 1961 was described from Peru, *H. flagelliseta* Balogh et Mahunka, 1981 from Paraguay, and *H. horridus* Pérez-Iñigo et Baggio, 1988 and *H. scoparius* Pérez-Iñigo et Baggio, 1993 from South Brazil (Balogh & Mahunka 1981, Hammer 1961, Pérez-Iñigo & Baggio 1988, 1993). Three new species of this genus were identified in a very rich material of soil mesofauna from Cuba, collected by Dr Josef Rusek (Institute of Soil Biology, Czech Academy of Sciences, České Budějovice, Czech Republic) given kindly to the author for determination. Descriptions of these new species are given in this contribution.

DESCRIPTION OF NEW SPECIES

Hermannobates hammerae sp. n.
(Fig. 1)

DIAGNOSIS. Central part of notogaster without areolae, 15 pairs of notogastral setae, 3 pairs of them on posterior part of notogaster long.

DESCRIPTION. Length 920–956 µm, width 605–620 µm, holotypus: length 920 µm, width 605 µm, colour dark brown, whole body covered by thick layer of cerotegument.

Prodorsum (Fig. 1A): rostrum smooth, broadly oval, rostral and lamellar setae smooth, with spike on the tip, approximately equal in the length, both originating on small tubercules. Central part of prodorsum smooth, on its lateral borders rich tubercules. Interlamellar setae strong, stick-shaped, roughed on whole length, three times longer than lamellar ones, originating on small shield connected with bothridium. Sensillus originated in cup-shaped, comparatively large bothridium, strong, roughed on the whole length, inexpressively extended on its top, and ended by sharp tip. Exobothridial setae minute, hardly distinguishable, originating near the lateral border of bothridium.

Notogaster (Fig. 1A): almost globular with one pair of cup-shaped mouth of lateral notogastral glands, 15 pairs of notogastral setae, 3 pairs of them on posterior part of notogaster roughed, approximately as long as sensillus, 10 pairs of notogastral setae represented only by insertion points after separation of nymphal exuvia, 2 pairs of fine and short notogastral setae near posterior border of notogaster on ventral side of body. Surface of central part of notogaster smooth, without areolae or other sculptures, on its borders narrow zone of small points.

Epimeral region (Fig. 1B): covered by thick layer of cerotegument, epimeral formula 3–1–3–2, epimeral setae comparatively strong, approximately equal in length. Epimeral surface without conspicuous structures, on epimeral borders between epimerae I and II, and III, and III and IV tubercules gradually disappeared to the central part of this region.

Anogenital region (Fig. 1B): genital and anal plates large and near each other, epimerae IV separated by oval genital plates, with strongly sclerotized border, 7 pairs of genital setae, 6 pairs of them in one row, seta g5 situated laterally of this row. Genital plate surface with shallow pits, 1 pair of aggenital setae as long as epimeral ones. Anal plates longer than genital ones, separated by strong sclerotized line, bent backward, 2 pairs of adanal setae equal in length.

Infracapitulum: diarthric, setae h and m comparatively long, longer than seta a, all these setae smooth, rutellum with one incision, and with strongly sclerotized margin. In anterior part of rutellum one row of small pits.

Palps: with five joints, chaetotaxy 1–2–1–3–6(1), length and width of trochanter (14×35 µm), femur (51×45 µm), genu (20×20 µm), tibia (14×17 µm), and tarsus (33×13 µm).

Chelicerae: measurments of digitus fixus 239×103 µm, digitus mobilis 68×45 µm, digitus fixus and digitus mobilis with two blunt teeth. Roughed seta cha (100 µm) twice longer than smooth chb (48 µm). Length of distinct Trägårdh's organ 80 µm.

Legs: comparatively long, monodactylous, chaetotactic formula I 1–5–5(1)–5(2)–17(2)–1, II 1–5–5(1)–5(1)–15(2)–1, III 2–3–3(1)–4(1)–13–1, IV 1–3–3–4(1)–13–1, setiform famulus ϵ as long as solenidion ω_2 on tarsus I, solenidion ω_1 three times longer than ω_2. Tectal seta tc" is the longest one on length I, twice longer than seta tc'.

Only specimens without nymphal exuviae were found and it was not possible to reconstruct the length of centrodorsal setae of nymphal exuviae.

AFFINITIES. The new species differs from all *Hermannobates* species by the smooth surface of central part of notogaster.

TYPE MATERIAL. Holotype, K-307, Cuba, Province Santiago de Cuba, Gran Piedra, 21 October 1981, west slope, tree fern stand, dark moder sample, leg. J. Rusek, one paratype from the same locality as a holotype. Type material is deposited in ethanol and as a slide (paratypus) in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice in author's collection

ETYMOLOGY. The new species is named in honour of Dr Marie Hammer (Copenhagen, Denmark), the renowned Danish and world acarologist.

Hermannobates ruseki sp. n.
(Fig. 2)

DIAGNOSIS. Central part of notogaster with large areolae flowed together, interlamellar setae shorter than sensillus, 14 pairs of notogastral setae, 3 pairs of centrodorsal setae extended on nymphal exuvia.

DESCRIPTION. Length 762–795 µm, width 485–520 µm, holotypus: length 795 µm, width 520 µm. Colour dark brown with paler areolae and pits, whole body covered by thick layer of cerotegument.

Prodorsum (Fig. 2A): rostrum oval, smooth, rostral and lamellar setae smooth, originating on small tubercules, bent and pointed. Lamellar setae longer than rostral ones, interlamellar ones roughed on the whole length, three times shorter than sensillus, approximately as long as rostral ones, originating on small shield connected with bothridium. Sensillus long, strong, stick-shaped, originating in conspicuous cup-shaped bothridium, smooth in basal part, roughed on the tip. Exobothridial setae minute, hardly distinguishable, originating near lateral border of bothridium. Surface of prodorsum in interbothridial region and on rostrum smooth, in central part of prodorsum behind insertions of lamellar setae and on the border of prodorsum with conspicuous sculpture, consisting of large irregular areolae.

Notogaster (Fig. 2A): almost globular with one pair of conspicuous, cup-shaped mouth of lateral notogastral glands, 14 pairs of notogastral setae, 3 pairs of them long, flagelliform on posterior part of notogaster. One pair of them short, fine, near posterior border of notogaster on

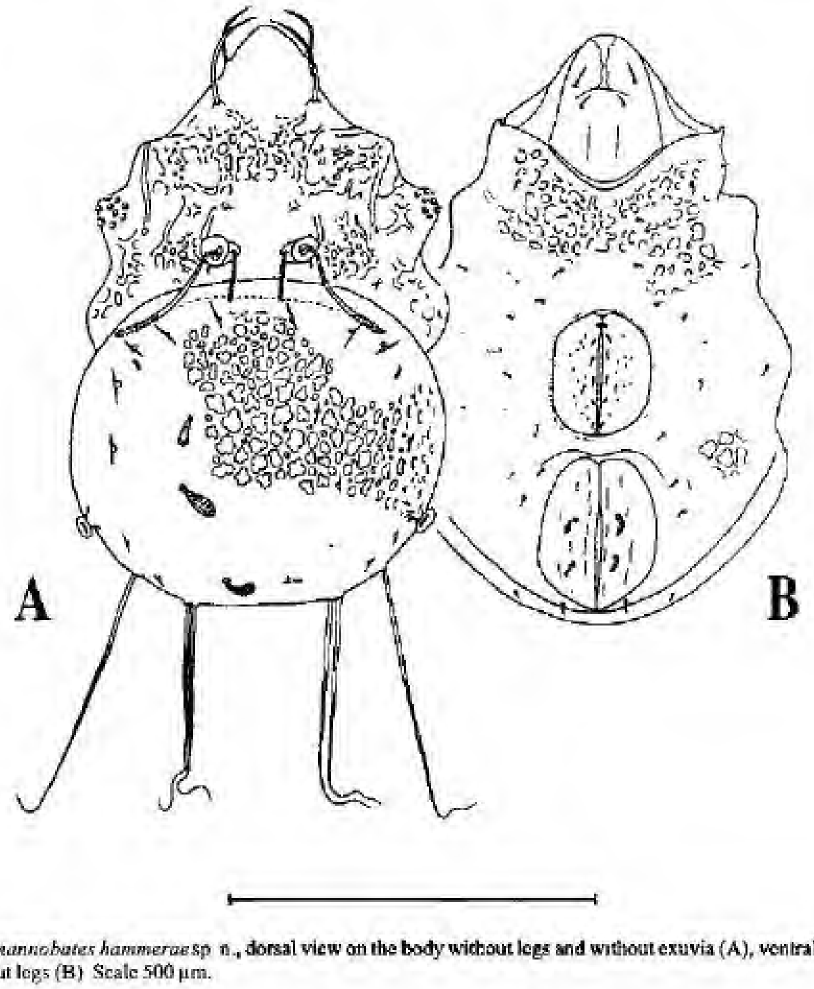

Fig. 1. *Hermannobates hammerae* sp. n., dorsal view on the body without legs and without exuvia (A), ventral view on the body without legs (B). Scale 500 µm.

the ventral side of the body. Nymphal exuvia bears 3 pairs of centrodorsal setae, 10 pairs of insertion points of notogastral setae remain on notogaster after separation of nymphal exuvia. Anterior border of notogaster smooth, central part with conspicuous sculptures consisting of large irregular areolae flowed together, forming irregular net.

Epimeral region (Fig. 2B): covered by thick layer of cerotegument, epimeral formula 3–1–3–2, epimeral setae short, equal in length, surface of epimerae with conspicuous sculptures, consisting irregular large areolae, forming irregular net. Epimerae inexpressively separated.

Anogenital region (Fig. 2B): with conspicuous net sculptures, genital and anal plates large and near each other, oval genital ones bear 7 pairs of genital setae, 6 pairs of them in one row, seta g_5 in lateral position, one pair of smooth aggenital setae, as long and strong as epimeral ones. Anal plates longer than genital ones with 2 pairs of blunt, roughed anal setae, 3 pairs of adanal setae. Genital and anal plates separated by sclerotized line bent backward in front of the setae ad_3.

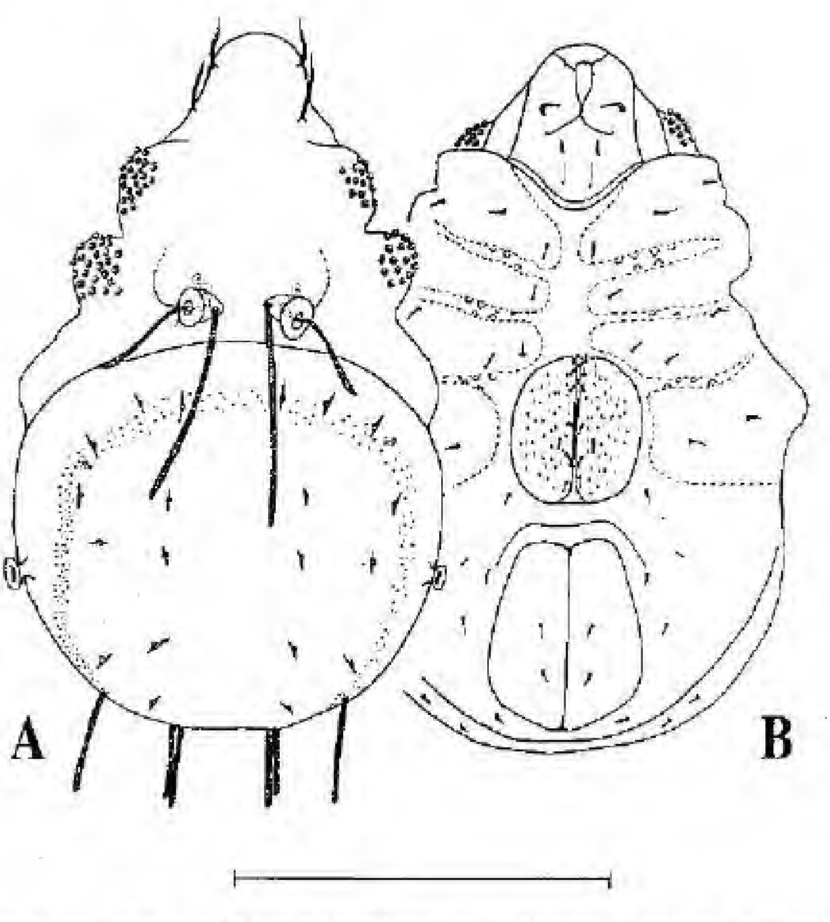

Fig. 2. *Hermannobates ruseki* sp. n., dorsal view on the body without legs, right side of the body without exuvia (A), ventral view on the body without legs (B). Scale 500 µm.

Infracapitulum setae h and m longer than setae a, diarthric type, rutellum with one row small pits on anterior, more sclerotized margin, with one row of small pits on anterior part of rutellum

Palps with five joints, chaetotaxy 1–2–1–3–6(1), length and width of trochanter (10×20 µm), femur (39×24 µm), genu (14×16 µm), tibia (14×13 µm), and tarsus (28×11 µm) Solenidion ω longer than seta cm

Chelicerae length and width of digitus fixus 195×75 µm, digitus mobilis 56×43 µm, both with 2 very blunt teeth, length of roughed setae cha 75 µm, chb 45 µm, length of distinct Tragårdh's organ 68 µm

Legs monodactylous, comparatively long, chaetotactic formulae I 1–5–5(1)–5(2)–17(2)–1, II 1–5–5(1)–5(1)–15(2)–1, III 2–3–3(1)–4(1)–13–1, IV 1–3–3–4(1)–12–1 Tarsus IV without setae v'', solenidion ω_2 four times shorter than ω_1 and as long as famulus ∈ on tarsus I

AFFINITIES This species differs expressively from other congeners by short interlamellar setae and large foveolae flowed together in central part of notogaster, forming irregular net

TYPE MATERIAL Holotype, K-280, Cuba, Isla de la Juventud, Arroyo Habo, 16 October 1981, *Pinus* sp and *Coccothrinax sp*, brown sandy soil ample leg J Komarek, and one paratype from the same locality Type material is deposited in ethanol and as a slide (paratype) in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic České Budějovice

ETYMOLOGY The new species is named in honour of Dr Josef Rusek (Institute of Soil Biology, Czech Academy of Sciences,České Budějovice, Czech Republic), renown world apterygotologist and soil ecologist, who gave me kindly very rich material from Cuba

Hermannobates cubanus sp. n.
(Fig 3)

DIAGNOSIS 14 pairs of notogastral setae, 6 of them very long, flagelliform, central part of notogaster with small, oval areolae, prodorsum without areolae

DESCRIPTION Length 665–920 µm, width 455–630 µm, holotypus length 910 µm, width 560 µm Colour dark brown with paler areolae, thick layer of cerotegument covers whole body

Prodorsum (Fig 3A) rostrum oval, rostral and lamellar setae smooth, originating on sclerotized shield connected with bothridium Sensillus stick-shaped, long, smooth, finely roughed only on the tip, originating on lateral border of bothridium, central part of prodorsum smooth with finely expressed line In lateral part of prodorsum fields rich in small tubercules

Notogaster (Fig 3A) almost globular with one pair of cup-shaped mouth of lateral glands, 14 pairs of notogastral setae, 6 pairs of them long, flagelliform, from which 3 pairs originating on nymphal exuvia and 3 pairs originating on small tubercules on posterior part of notogaster, 10 pairs of insertion points of setae on notogaster after separation of nymphal exuvia One pair of fine, short setae near posterior border of notogaster on ventral side of body Comparatively small oval areolae in central part of notogaster, their diameter smaller than distance between them, size of areolae reduced toward notogastral border

Epimeral region (Fig 3B) covered by thick layer of cerotegument, epimeral formula 3–1–3–2, epimeral setae smooth, some tubercules situated on epimeral borders between epimerae I and II, II and III, III and IV Epimerae separated conspicuously from each other

Anogenital region (Fig 3B) genital and anal plates large, oval genital ones separate wholly epimera IV, with 7 pairs of genital setae, 6 pairs of them in one row, seta g_5 in lateral position Surface of genital plates with fine pits, 1 pair of smooth aggenital setae Anal plates with 2 pairs of smooth anal setae, 3 pairs of adanal setae approximately equal in length, shorter than genital and epimeral ones, genital and anal plates separated by sclerotized line bent backward

Infracapitulum: diarthric, setae h and m comparatively long, longer than setae a, rutellum with one conspicuous incision on sclerotized anterior margin of rutellum, one row of small pits on anterior part of rutellum.

Palps: with five joints, chaetotactic formula 1–2–1–3–6(1), length and width of trochanter (9×20 µm), femur (52×24 µm), genu (20×18 µm), tibia (10×10 µm), and tarsus (27×10 µm). Solenidion ω as long as seta cm.

Chelicerae: length and width of digitus fixus 234×92 µm, digitus mobilis 64×42 µm, both with two blunt teeth, length of roughed seta cha 104 µm, chb 47 µm, length of conspicuous Trägårdh's organ 92 µm.

Legs: monodactylous, comparatively long and strong, leg chaetotactic formula I 1–5–5(1)–5(2)–17(2)–1, II 1–5–5(1)–5(1)–15(2)–1, III 2–3–4(1)–4(1)–14–1, IV 1–3–3–4(1)–13–1, solenidion ω_2 three time shorter than ω_1 and as long as famulus ϵ on tarsus I, on genu III seta l'' present, and tarsus IV without seta v''.

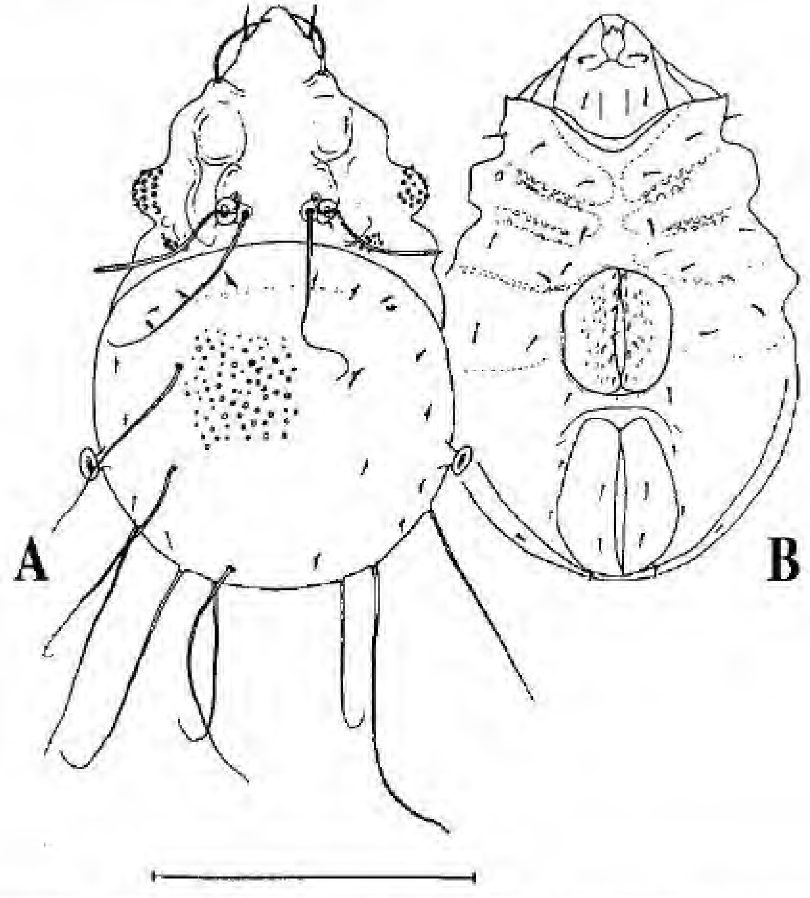

Fig. 3. *Hermannobates cubanus* sp. n., dorsal view on the body without legs, right side of the body without exuvia (A), ventral view on the body without legs (B). Scale 500 µm.

AFFINITIES. This species is closely related to the type species *H. monstruosus* and differs from it by the smooth central part of prodorsum, by presence of 3 pairs of very long, flagelliform setae on the nymphal exuvia, which are longer than sensillus. *H. monstruosus* has these setae shorter than sensillus.

TYPE MATERIAL, Holotype, K-192, Cuba, Province Sancti Spiritus, Escambray Mountains, Topes de Collantes, 1 December 1979, litter sample from *Pinus caribea* forest, leg. J. Rusek. Eighteen paratypes, three from the same locality as a holotype, others from K-191, Cuba, Province Sancti Spiritus, Escambray Mountains, Topes de Collantes, 1 December 1979, decaying bark sample in *Pinus caribea* plantation, leg. J. Rusek, K-194, Cuba, Province Sancti Spiritus, Escambray Mountains, Topes de Collantes, 1 December 1979, *Pinus caribea* plantation, litter sample, leg. J. Rusek, K-197, Cuba, Province Sancti Spiritus, Escambray Mountains, Topes de Collantes, 1 December 1979, *Pinus caribea* sp. plantation, sample of fine roots from a tree, leg. J Rusek, K-198, Cuba, Province Sancti Spiritus, Escambray Mountains, Topes de Collantes, 1 December 1979, soil sample from *Pinus caribea* forest, leg. J Rusek, K-327, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 November 1981, submontane forest, rendzina sample, leg. J. Rusek, K-329, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 December 1981, litter sample from submontane forest, leg. J. Rusek, K-331, Cuba, Province Pinar del Rio, Sierra del Rosario, Yagrumal, 18 December 1981, bark and mosses sample, leg. J. Rusek, K-336, Cuba, Province Pinar del Rio, Sierra del Rosario, Vayesito, 18 November 1981, submontane forest, dry bark sample from a log, leg. J. Rusek, K-338, Cuba, Province Pinar del Rio, Sierra del Rosario, Vayesito, 18 December 1981, submontane forest, Decaying wood, sample from a log, leg. J. Rusek, K-339, Cuba, Province Pinar del Rio, Sierra del Rosario, Vayesito, 18 November 1981, submontane forest, litter sample, leg. J. Rusek. Type material is deposited in ethanol in author's collection in the Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic

Key to the all species of the genus *Hermannobates* described so far

1 Interlamellar setae shorter than sensillus. .... *Hermannobates ruseki* sp. n.
– Interlamellar setae longer than sensillus. 2
2 Surface of central part of notogaster smooth, without areolae. .... *Hermannobates hammerae* sp. n.
– Surface of central part of notogaster with areolae. 3
3 Centrodorsal setae of nymphal exuvia longer than sensillus, diameter of notogastral areolae smaller than distance between them. .... *Hermannobates cubanus* sp. n.
– Centrodorsal setae of nymphal exuvia shorter than sensillus, diameter of notogastral areolae larger than distance between them 4
4 Posteromarginal setae claviform, rough and short .... *Hermannobates scoparius* Pérez-Íñigo et Baggio, 1993
– Posteromarginal setae long, never claviform 5
5 Centrodorsal setae of nymphal exuvia setiform, tapering on tip, 5 pairs of very long posterior notogastral setae .... *Hermannobates monstruosus* Hammer, 1961
– Centrodorsal setae of nymphal exuvia broad on tip, 4 pairs of long setae on posterior part of notogaster. 6
6 Interlamellar and posteromarginal notogastral setae rough never flagelliform .... *Hermannobates horridus* Pérez-Íñigo et Baggio, 1988
– Interlamellar and posteromarginal notogastral setae smooth, later ones flagelliform .... *Hermannobates flagelliseta* Balogh et Mahunka, 1981

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(e) Schornikov E. I. 1969: A new family of Ostracoda from the supralitoral zone of Kuril Islands. Zool. Zh. 48: 494–498 (in Russian, Engl. abstr.).

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